Next Generation Science Standards Systems Implementation Plan for California

November 2014

California Department of Education

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Executive Summary

On September 4, 2013, the State Board of Education (SBE) voted unanimously to adopt the Next Generation Science Standards for California Public Schools, Kindergarten through Grade Twelve (CA NGSS). The CA NGSS present a once in a generation opportunity for the California Department of Education (CDE), Local Educational Agencies (LEAs), and community stakeholders to reset science education to more effectively prepare all our students with the knowledge and skills they need to understand and shape our increasingly technology-driven world.

The Next Generation Science Standards Systems Implementation Plan for California (*Plan*) will begin the important and well-anticipated process of updating school curriculum and equipment to match the latest scientific knowledge and technology. More significant and difficult work will be needed to take teaching and learning into areas that are new and unfamiliar to many educators and students; from incorporating science and engineering practices into instruction to using project based learning and other instructional strategies. The challenges of integrating these strategies throughout all grade levels and merging learning across multiple subjects and disciplines will create unique opportunities for teaching and learning throughout California.

This implementation plan, developed with input from a wide array of stakeholders, and grounded in the latest research and experience about what works, sets a roadmap to achieve dramatic and necessary transformations in how science will be taught in every school throughout the state. It will also require sustained leadership and resources to reach its ambitious goals. The *Plan* is not to identify or discuss the specifics of the standards themselves—many other resources produced by the CDE and its collaborative partners provide reviews and analyses of the CA NGSS. Rather this *Plan* is a guide, a set of possible strategies that can be interwoven to assist in the development of regional and local implementation plans. These strategies will be a foundation on which additional strategies are built. Many of the recommendations will require additional resources, funding, and/or policy change. The CDE, LEAs, and community stakeholders will need to determine which strategies to pursue, partially based on available and anticipated resources and funding. LEAs are encouraged to incorporate suggestions identified in the *Plan* which meet the needs of their community and to support implementation of the CA NGSS by advocating for inclusion in their Local Control Accountability Plans.

The CDE, LEAs, and community stakeholders may use this *Plan* to develop specific CANGSS implementation action plans relative to each organization's goals and target populations. When each implementation phase should begin or end is not prescribed and should be based on local goals and local needs.

The *Plan* builds upon lessons learned from California's experience implementing the California Common Core State Standards (CA CCSS), connecting CA-NGSS implementation strategies to promising innovations in professional learning, curriculum development, assessment, and other systems currently being redesigned as part of CA CCSS implementation. The plan also identifies opportunities to increase efficiency, particularly in the areas of curriculum and instructional resources, by leveraging similar NGSS work in other states. The CA NGSS are correlated and aligned to the adopted CA CCSS in English Language Arts and Mathematics. The CA NGSS do not prescribe a curriculum nor determine instructional strategies; rather they are intended to guide the development of curriculum, instruction, and supporting resources.

Dedicated resources need to be identified by all stakeholders to meet the plan's ambitions. If funding is available, a survey will be offered to all stakeholders involved in the implementation of the CA NGSS throughout the state. Survey data will be analyzed by the statewide coalition and results will be reported to the community stakeholders and the LEAs. Results from the surveys can provide a clearer understanding of successes and possible needs and gaps in the CA NGSS implementation across the state. Implementation progress and recommendations based on survey results will be reported to the SBE for the first four years of implementation, 2016 through 2020.

The *Plan* identifies eight strategies and accompanying activities and indicators across the three phases (awareness, transition, and implementation) for the implementation of the CA NGSS. The guiding strategies show not only how existing operational systems will be redeployed, but also how these strategies will interweave to tackle some of the major challenges for science education in California. It is therefore critical that this plan be supported with sufficient resources to fully address these challenges which include:

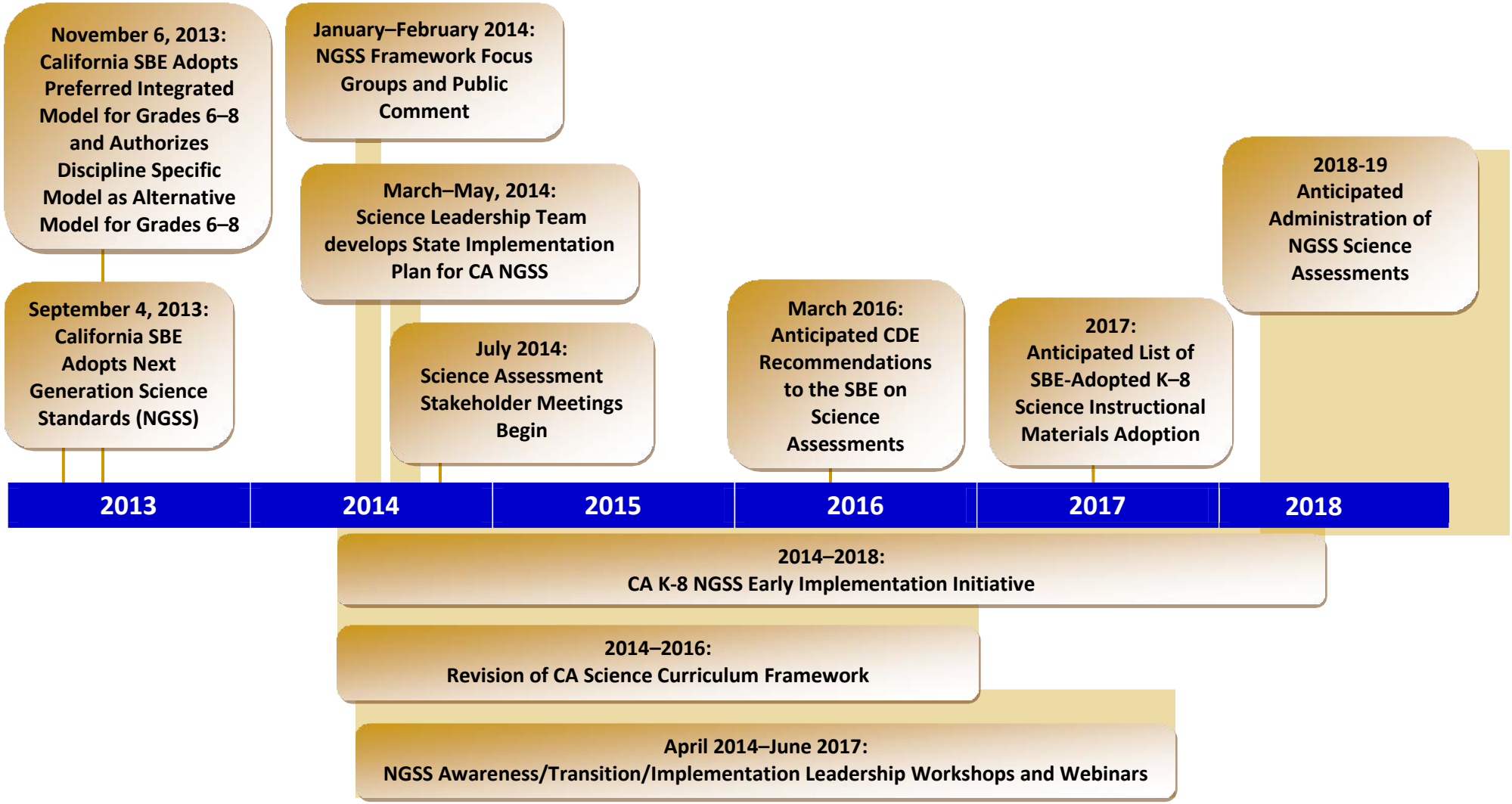
- Expanding science education in elementary schools to ensure all students develop the fundamentals of scientific understanding from the earliest grades.
- Supporting educators to deliver instruction in ways that integrate content among and beyond the scientific disciplines in order to connect students to the way problems exist in the real-world.
- Providing ongoing, job-embedded professional learning to grow teacher capabilities to effectively implement the pedagogical shifts of the CA-NGSS and help school leaders create and support the conditions for more rigorous and engaging science learning.
- Coordinating with partners within and well beyond the traditional education community in order to expand the time and resources available to support student learning at the increased scale needed to achieve much needed large improvements in student access and achievement.

Successful use of this *Plan* will require ongoing collaboration between the CDE, LEAs, and community stakeholders. The scope of change and the expectations for shifting instruction are ambitious. It's going to take new dedicated resources, as well as repurposing of existing resources, to carry out the *Plan* and particularly to launch its more innovative components if we wish to fully meet expectations for improving student achievement and equity. The *Plan* provides guidance for all audiences to build understanding, foster interest, and lay the foundation for quality across all phases of implementation of the CA NGSS.

CA Next Generation Science Standards Systems Implementation Timeline and Key Events

For events that occurred prior to September 2013, please refer to the Timeline available on the CDE Web site at http://www.cde.ca.gov/pd/ca/sc/ngsstimeline.asp. For an accessible version of the timeline below, please refer to the Accessible Alternative Version on the CDE Web site at http://www.cde.ca.gov/pd/ca/sc/ngssimptimeline.asp.

The implementation timeline does not specify the beginning or ending points of time for the different implementation phases because they vary depending on the event or may be contingent on the conclusion of a related event.



INTRODUCTION

California Department of Education Mission Statement

California will provide a world-class education for all students, from early childhood to adulthood. The California Department of Education serves our state by innovating and collaborating with educators, schools, parents, and community partners. Together, as a team, we prepare students to live, work, and thrive in a highly connected world.

The California Department of Education (CDE) manages the state's diverse and dynamic public school system, which is responsible for the education of more than six million children and young adults in more than 10,000 schools. The CDE and the State Superintendent of Public Instruction (SSPI) are responsible for enforcing education law and regulations; and for continuing to reform and improve public elementary school programs, secondary school programs, adult education, and some preschool and child care programs based on policy direction provided by the SBE.

Background Information

Senate Bill 300 [http://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201120120SB300&search_keywords], chaptered in 2011, required SSPI Torlakson to present new science standards, based on the NGSS, to the California SBE by July 31, 2013. The SBE had until November 30, 2013 to adopt, modify, or reject the proposed standards.

In September 2011, California became one of 26 lead states to develop the NGSS based on the National Research Council's (NRC) *A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas (Framework)*. Achieve, Inc., an independent, bipartisan, non-profit organization based in Washington, D.C., facilitated the process on behalf of the states. The NRC, as presented in the *Framework,* envisions that by the end of 12th grade all students should:

- Develop some appreciation of the beauty and wonder of science.
- Possess sufficient knowledge of science and engineering to engage in public discussions on related issues.
- Be careful consumers of scientific and technological information related to their everyday lives.
- Be able to continue to learn about science outside school.

- Have the skills to enter careers of their choice, including (but not limited to) careers in science, engineering, and technology [adapted from *A Framework for K-12 Science Education,* (2012), p.1].

In November 2011, SSPI Torlakson convened a State Review Team (SRT) consisting of 80 science experts representing kindergarten through grade twelve (K–12) science teachers, administrators, county science consultants, college and university professors, scientists, science informal centers, and business and industry. Over a span of nearly 18 months, the SRT reviewed many drafts of the NGSS as a way to provide feedback to Achieve, Inc. and the CDE.

In April 2013, after the final draft of the NGSS was released, SSPI Torlakson convened a Science Expert Panel (SEP), a smaller representative group of the SRT, which also included well-known scientists, Dr. Helen Quinn, Dr. Bruce Alberts, and Dr. Art Sussman. The SEP met three times from April to June 2013, to review feedback from three regional public meetings, SRT surveys, and to make final recommendations for the California standards based on the NGSS to the SSPI.

On September 4, 2013, the SBE voted unanimously to adopt the *Next Generation Science Standards for California Public Schools, Kindergarten through Grade Twelve* (CA NGSS) as required by California *Education Code* Section 60605.85. The NGSS Appendices A–M were also adopted to assist educators in the implementation of the new science standards. On November 6, 2013, the SBE voted unanimously to adopt the California Integrated Model as the preferred model for middle grades, and directed CDE to develop an alternative discipline specific model for grades six through eight (6–8) based upon the discipline-specific model outlined by Achieve in the NGSS Appendix K. More information regarding SBE items can be found at http://www.cde.ca.gov/be/mt/ms/index.asp. More information regarding the CA NGSS preferred integrated and alternative discipline specific models can be found at http://www.cde.ca.gov/pd/ca/sc/ngssstandards.asp.

The Purpose of This State Plan

The CA NGSS have the potential to transform science education in California necessitating a different way of thinking about teaching and learning. What differentiates the CA NGSS from previously-adopted California science standards is the way the CA NGSS weave together the three dimensions (scientific and engineering practices, disciplinary core ideas, and crosscutting concepts) of the *Framework* across the NGSS scientific disciplines (physical science, life science, and earth and space science), with engineering, technology, and practical applications of science. The CA NGSS focus on knowledge used for performance expectations, which correlate and align to the adopted *Common Core State Standards (CCSS)* in English Language Arts and Mathematics, and require students to demonstrate their understanding of the three dimensions through the application of science and engineering. The performance expectations also provide a context for

learning science and specify how scientific knowledge is acquired and how the disciplines of science are connected.

The standards neither prescribe a curriculum nor determine instructional strategies; rather they are intended to guide the development of all of these resources.

The Next Generation Science Standards Systems Implementation Plan for California (Plan) [http://www.cde.ca.gov/pd/ca/sc/ngssintrod.asp] will assist the CDE, the local educational agencies (LEAs), and community stakeholders to collaboratively actualize the CA NGSS in educational systems for every student.

Many of the recommendations in this *Plan* will require additional resources, funding, and/or policy change in order to be implemented. Ongoing guidance will be needed as state and local policy makers, CDE, LEAs, partners, and community stakeholders develop action plans to engage in actual activities. More detailed work plans will need to be developed in order to estimate needed funds and necessary policy changes. The CDE anticipates this *Plan* will provide assistance and guidance to the implementation of the CA NGSS throughout the state.

Phases of Implementation

Implementation of CA NGSS systems will occur over several years and in the context of a continuous learning process. Accordingly, the *Plan* exists within varying phases of the change process. The three phases are straightforward, yet lightly defined, because for each proposed program and project, there exists an ongoing development and progression that must evolve at both an individual elemental level and the integrated systems level.

- The **awareness phase** represents an introduction to the CA NGSS, the initial planning of systems implementation, and establishment of collaborations.
- The **transition phase** is the concentration on building foundational resources, implementing needs assessments, establishing new professional learning opportunities, and expanding collaborations between all stakeholders.
- The **implementation phase** expands the new professional learning support, fully aligns curriculum, instruction, and assessments, and effectively integrates these elements across the field.

California's Diverse Stakeholders

An integrated systems approach to implementing the CA NGSS provides coherence and necessitates extensive communication and collaboration among all of California's stakeholders. The CDE is working diligently to ensure clear communications and expectations, and this document is an important component of this goal. The engagement and assistance of all stakeholders will ensure successful implementation of the CA NGSS. The role of each stakeholder group in contributing to the implementation is vitally important to the success of the *Plan*.
The CA NGSS were created by representative groups of teachers, administrators, parents, content experts, support providers, business/industry and education professionals, each bringing a unique educational perspective into the development of the standards.

The *Plan* addresses how the implementation will vary by three groups: the CDE, the LEAs, and Community Stakeholders. LEAs include districts, schools, and county offices of education. Community Stakeholders include, but are not limited to: business and industry, institutions of higher education, teacher preparation programs, the Commission on Teacher Credentialing (CTC), parent groups, professional learning providers, professional organizations, public media providers, science centers and museums, science informal education providers, and nonprofit organizations.

The CDE is responsible for integrating the CA NGSS into the statewide educational system. It implements state and federal laws through administration of statewide programs. State and local officials can support implementation by creating and opening doors for opportunity.

State officials and local districts, institutions of higher education and the CTC can collaborate to ensure that teacher preparation programs and science credentialing are aligned with the CA NGSS. But beyond these governmental groups, a wide array of community partners can seek to support educators in many ways. Professional organizations, including support providers and those representing educators, are a key component in providing information, feedback, and support throughout the implementation process. This document not only charts the path for CA NGSS systems implementation but illuminates opportunities for extensive involvement.

LEAs are the entities responsible for the integration of the CA NGSS into curriculum, instruction, and professional learning. Teachers are on the front line of implementing the CA NGSS. School site administrators provide teachers with instructional leadership and maintain a safe learning environment for both students and teachers. District administrations and elected boards can establish policies designed to implement state and federal programs and empower teachers and site administrators with local creativity and flexibility. County offices of education and other support providers can provide technical assistance and professional learning support at the regional level for the schools and districts they serve.

The role of the families, parents, and guardians is all encompassing. Involvement at every level of a student's education is fundamental for each student's personal success. Families, parents, and guardians can ensure that students arrive at school ready to learn, provide quiet time and space at home for students to study, and stay involved in their students' learning through positive engagement in their academic work and social interactions. Additionally, there are many opportunities for involvement at the school site, providing support for administrators, teachers, and students.

Of all stakeholders, students are most important to think about when implementing the new standards. Through engaging content taught by well-prepared teachers using effective strategies, students will respond with interest and perform to their best ability. The role of every other stakeholder group is to ensure that students—all students—gain meaningful access to the content and that all necessary support systems are in place.

Partners and support providers such as county offices of education, professional development providers, state parent groups, state afterschool and early childhood providers provide links between the CDE and the LEAs implementing the CA NGSS. Support provider roles offer a systems-based approach to professional learning for all stakeholders.
In reviewing this document, stakeholders should note instances for potential involvement. For various groups, these opportunities may be different. Teachers and administrators may wish to participate in professional learning opportunities.

Families may wish to view CDE-sponsored webinars or review available publications. In many cases, the opportunity for stakeholder input will be more open-ended. For example, the SBE invites public comment on meeting agenda items. In other instances, the CDE will seek stakeholder feedback on particular issues, such as the draft science framework or the development of standards-aligned assessments. Involvement may be as easy as subscribing to a listserv for information on a particular topic. The opportunities abound, and the CDE and SBE welcome and encourage participation.

Guiding Strategies

The *Plan* is grounded in eight guiding strategies for implementation. These strategies encompass all areas of our educational system, and while they provide focus to the work, they also reveal its highly integrated nature. The eight guiding strategies for the CA NGSS systems implementation are:

1. Facilitate high quality professional learning opportunities for educators to ensure that every student has access to teachers who are prepared to teach and facilitate student learning to the levels of rigor and depth required by the CA NGSS.

2. Provide CA NGSS-aligned instructional resources designed to meet the diverse needs of all students.

3. Develop and transition to CA NGSS-aligned assessments that supports the improvement of teaching and learning and provide information that may be used for accountability.

4. Collaborate with parents, guardians, and the early childhood and expanded learning communities to integrate the CA NGSS into programs and activities beyond the K–12 school setting.

5. Collaborate with the postsecondary and business communities and additional stakeholders to ensure that all students are prepared for success in career and college.

6. Seek, create, and disseminate resources to support stakeholders as the CA NGSS systems implementation moves forward.

7. Design and establish systems of effective communication regarding CA NGSS among stakeholders to continuously identify areas of need and disseminate information.

8. Build coalitions to ensure a consistent message and to sustain momentum during implementation.

Process for Development of the *Plan*

The CDE convened representatives from many science stakeholder organizations (e.g., K–12 teachers, administrators, college and university faculty, parent groups, business and industry, county offices of education, professional learning providers, public media providers, informal science centers, and professional organizations) to collaborate on the development of this *Plan*. Over three months, the Science Leadership Team (SLT) with WestEd/K-12 Alliance staff members serving as facilitators, identified important elements of each strategy, developed activities/indicators for each stakeholder and phase, sought input from their constituents at each step of the process, and revised and refined the *Plan* based on the feedback. CDE then asked its different program offices to review the *Plan* and provide comments. The *Plan* was released for a 30-day public comment period beginning July 25, 2014 and was presented for information to the SBE in September 2014. Based on public comment and input from the SBE and CDE leadership, the *Plan* was revised and presented to the SBE for action in November 2014.

Integration with the Common Core State Standards Systems Implementation Plan for California

California's standards have been hailed for their rigor, setting high expectations for all students. Beginning in 1997, California adopted content standards in English language arts (ELA), mathematics, history/social science, science, visual and performing arts, health, world language, physical education, school library standards, and career technical education. California also has English language development (ELD) standards, which outline the stages of proficiency that English learners progress through as they become proficient in English.

The SBE adopted the Common Core State Standards (CCSS) in ELA and Mathematics, including California-specific standards on August 2, 2010. While CCSS in ELA include literacy components in science, they are not directly linked to the CA NGSS and can be found at http://www.cde.ca.gov/be/st/ss/documents/finalelaccssstandards.pdf, and the CCSS for Mathematics can be found at http://www.cde.ca.gov/be/st/ss/documents/ccssmathstandardaug2013.pdf. Embedded within the CA NGSS are tables explaining the alignment with the CCSS. In addition, CA NGSS Appendix L–Connections to CCSS–Mathematics and Appendix M–Connections to CCSS–Literacy in Science and Technical Subjects [http://www.nextgenscience.org/next-generation-science-standards] further elaborate on the connections between the CA NGSS with the CCSS.

Prior to the development of this *Plan*, the SBE adopted the CCSS Systems Implementation Plan for California (Revised 30-Apr-2014) [https://www.cde.ca.gov/re/cc/documents/ccsssimplementationplan.pdf] on March 7, 2012. The CCSS Systems Implementation Plan is a living document that identifies major phases and activities in the implementation of the

CCSS throughout California's educational system. With the implementation of the CCSS preceding the implementation of the CA NGSS, the CDE and LEAs will need to consider similarities and the significant milestones of each plan and their relationships. For example, strategies 1 through 7 are similar in both plans and provide a common context where coordination can occur to maximize the use of limited resources and specifically include:

- Professional development and outreach opportunities mentioned in Strategy 1.
- Outreach to similar stakeholder groups mentioned in Strategy 4.
- Communication with partnerships established for Career Technical Education programs to engage members of the local business and postsecondary communities mentioned in Strategy 5.

Introduction for Strategy 1: Professional Learning

Facilitate high quality professional learning opportunities for educators to ensure that every student has access to teachers who are prepared to teach and facilitate student learning to the levels of rigor and depth required by the CA NGSS.

Successful enactment of this strategy requires a collaborative partnership between the CDE, LEAs, and community stakeholders including, but not limited to: county offices of education, professional learning providers, institutions of higher education, the CTC, teacher preparation programs, environmental education providers, science centers and museums, science informal education providers, business and industry partners, professional organizations, and private sector partners.

This strategy incorporates many shifts in instructional practice required by the CA NGSS. It includes professional learning in three-dimensional (3D) teaching and learning (Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts); science for all students; and connections to other applicable CA state standards by topic and grade span. The shifts require a systems approach to science education, whereby policies, programs, personnel, and resources all support common goals.

WestEd's K-12 Alliance has already set the stage for professional learning through an early implementation initiative, the "California K-8 NGSS Early Implementation Initiative". Working with a limited number of schools, this initiative, launched in August 2014, includes intensive professional learning over four years, serves as a lab to beta-test CA NGSS aligned tools and processes, and includes the CA NGSS Collaborative Network to share learning and challenges.

Strategy 1 includes the following three elements:

- **Teacher and Administrator Professional Learning**. This element makes recommendations for developing an expanded pool of teachers trained in CA NGSS professional development and creating regional professional learning communities comprised of these trainers. This element also recognizes the increased focus on scientific and engineering practices at all grade levels and the need for greater teacher understanding of instructional strategies in this area.

- **Resources for Professional Learning:** This element addresses the development of a CA NGSS Digital Center on which resources for teaching, learning, and stakeholder understanding of the CA NGSS can be posted. This CA

NGSS Digital Center will be housed on the "My Digital Chalkboard" Web site at https://www.mydigitalchalkboard.org/, sponsored by the CDE. This portal is intended to be a secure interactive central repository with options for uploading and downloading resources, use of search engines, user reviews, and access by all stakeholders. Additional features may include: community spaces, options for resources organized by region, and posting of public awareness materials. Development of this CA NGSS Digital Center is contingent upon availability of funding.

- **Teacher Preparation and Credentialing:** This element addresses science teacher credentialing and teacher preparation aligned with CA NGSS.

Suggestions for CA NGSS professional learning at the LEA and community stakeholder levels are also provided.

Strategy 1

California Department of Education Implementation Plan for the CA NGSS

Facilitate high quality professional learning opportunities for educators to ensure that every student has access to teachers who are prepared to teach and facilitate student learning to the levels of rigor and depth required by the CA NGSS.

ELEMENT	AWARENESS	TRANSITION	IMPLEMENTATION
Teacher and Administrator Professional Learning	CDE participates with other professional learning stakeholder organizations to convene CA NGSS awareness roll-out workshops and webinars for local teams of teacher leaders and administrators.	CDE participates with other professional learning stakeholder organizations to convene CA NGSS transition roll-out workshops and webinars for local teams of teacher leaders and administrators focused on the differentiated needs and standards for each grade span.	CDE participates with other professional learning stakeholder organizations to evaluate the workshops and webinars; and based on this information, plan additional professional learning needed for CA NGSS workshops and webinars for local teams of teacher leaders and administrators.

ELEMENT	AWARENESS	TRANSITION	IMPLEMENTATION
	CDE participates with other professional learning stakeholder organizations, LEAs, and content area experts to determine the needs of teachers in understanding how to provide instruction in the scientific and engineering processes.	Contingent on funding, professional learning for teachers and administrators is developed by experts in the field that specifically addresses instructional strategies related to the scientific and engineering processes.	Professional learning for CA NGSS is continually monitored and revised to reflect the needs of the teachers and administrators.
Resources for Professional Learning	CDE, in collaboration with education partners and national partner Achieve, develops a CA NGSS Digital Center portal on the "My Digital Chalkboard" Web site for the posting of CA NGSS resources.	CDE researches resources that support the implementation of CA NGSS and posts information about, and links to, these resources on the CA NGSS Digital Center.	CDE continually researches and identifies CA NGSS resources and updates the CA NGSS Web site and the CA NGSS Digital Center accordingly.
Teacher Preparation and Credentialing	CDE works with the CTC to align science teacher credentialing with CA NGSS content and instructional shifts.	CDE works with Institutions of Higher Education to facilitate the inclusion of CA NGSS in teacher preparation programs.	CDE works with the CTC and Institutions of Higher Education to disseminate information about updated science credentialing requirements and teacher preparation programs.

Strategy 1
Suggestions and Opportunities for LEAs

- Develop a district science professional learning plan for all teachers and administrators.
- Explore each school's schedule to allow for collaborative planning time for the purpose of improved science instructional practices.

- Create a regional collaborative for ongoing professional development and sharing of resources.
- Select district/school teacher leaders, administrators, and professional development specialists to participate in the roll-out workshops for awareness, transition, and implementation of CA NGSS.
- Consider developing and/or researching existing teaching guidelines and coaching tools for CA NGSS instruction.
- Include the following concepts in local professional development activities:
    - Curricular and instructional shifts
    - 3-D teaching
    - Science and Engineering Practices
    - Engineering standards
    - Performance Expectations
    - Cross Cutting Concepts
    - Alignment with the Common Core State Standards
    - Local assessments and instructional materials as well as materials from national organizations
    - California Environmental Principles and Concepts (EP&Cs)
- Use the resources available on the CA NGSS Digital Center, My Digital Chalkboard, Achieve, National Science Teachers Association, and other sources.
- Differentiate professional learning for targeted student populations and needs, such as:
    - Elementary school
    - Middle school
    - High school
    - English language learners
    - Students with special needs

Strategy 1
Suggestions and Opportunities for Community Stakeholders and Support Providers

- Determine, address, and support professional learning needs of the education community and the community at large.
- Recommend resources for inclusion on the CA NGSS Digital Center.
- Assist in the development of professional development resources and events.
- Partner with CDE and LEA to research and develop indicators of best CA NGSS practices.
- California's professional development support providers consider collaborating to develop professional learning resources and opportunities aligned with CA NGSS for California educators and administrators.
- Institutions of Higher Education work with CDE, LEAs, community stakeholders, and the CTC to identify the CA NGSS instructional shifts for aligning teacher preparation programs and teacher certification in science.
- Community partners, especially those related to the STEM fields, should encourage stakeholder participation in the CA NGSS Leadership Rollouts.

Introduction for Strategy 2: Instructional Resources

Provide CA NGSS-aligned instructional resources designed to meet the diverse needs of all students.

Strategy 2 addresses the development, acquisition, and review of the CA NGSS-aligned curriculum resources to meet the diverse needs of all students. Enactment of this strategy requires a collaborative partnership between and among the CDE, the LEAs, expanded learning providers, support providers, philanthropic and nonprofit organizations, and other partners.

This strategy includes new curricular and instructional resources that are likely to be dynamic in format and content, e.g., digital materials, open educational resources, hybrid programs, and resources that include the California Environmental Principles and Concepts. These instructional resources provide a variety of options to LEAs, and other community partners.

LEAs will have an important decision to make regarding adoption of instructional materials and resources aligned to the CA NGSS. A recommended list of materials adopted by the SBE is available to help LEAs select materials, but the needs of the students in the community should have the largest impact on this local decision.

Strategy 2 includes the following elements:

- **Develop the CA NGSS Curriculum Framework:** The CDE in cooperation with the Instructional Quality Commission is responsible for facilitating the development of the 2016 CA NGSS Curriculum Framework (*Framework)* to be adopted by the SBE. SB 300 (Chapter 480, Statutes of 2013) authorizes the revision of the current *Science Framework for California Schools Grades K–12 (2004).*

- **Understand the Framework:** The *Framework* provides support in implementing the CA NGSS for all students. The CDE in cooperation with stakeholders will conduct “roll-outs” of the *Framework* throughout California to provide information and examples of CA NGSS best practices. This element addresses the development, implementation, and evaluation of the *Framework* roll-outs as well as next steps.

- **Investigate and Select Instructional Materials for all Grade Levels:** The *Framework* will contain the criteria for evaluating instructional materials used for science instruction in kindergarten through grade eight. The *Framework*, CA NGSS, and criteria provide guidance to publishers and developers of instructional materials for the submission of materials for state review. The criteria are also used by reviewers of instructional materials (K–8) submitted for adoption. If publishers meet the criteria, their materials are forwarded to the Instructional Quality Commission (IQC)

for possible recommendation to the SBE for adoption. For grades 9–12, LEAs are responsible for determining that instructional materials are aligned to content standards and meet the needs of all students.

Information on instructional materials, reviewers, and publishers may be found in the following statutes and Title 5 California Code of Regulations (CCR):

- The process of adopting curriculum frameworks, evaluation criteria and instructional materials is defined in 5 CCR 9510.
- The procedure for selecting reviewers of instructional materials is cited in 5 CCR 9512.
- When publishers submit instructional materials they must follow the process prescribed in 5 CCR 9517

The statutes that allow local education agencies to use instructional materials that are aligned to the CA NGSS but have not been adopted by the California State Board of Education are found in California *Education Code* (*EC*) sections 60210 (a) and 60210(c).

- **Promote Equity and Access to Instructional Resources:** This element addresses resources, information and strategies to facilitate equitable, quality, and safe science instruction.

  To meet the instructional needs of diverse learners, California uses a Multi-Tiered System of Supports (MTSS) model that aligns all systems of high quality instruction, support, and intervention and includes structures for building, changing, and sustaining systems. MTSS occurs in the context of excellent curricula, effective instruction, and a comprehensive assessment system as well as effective leadership, professional learning, and an empowering culture for staff and students. The supports below are necessary as part of California's commitment to educating all students, including students with special needs, English learners, and gifted and talented students:

  - Integrate the principals of Universal Design for Learning in creating and delivering accessible curriculum and lesson plans;
  - Model and highlight the benefits of collaborative lesson planning (between special education and general education);
  - Reinforce the importance of adopting materials that embed differentiated learning strategies for all students;

- Ensure that every student receives access to grade level science standards utilizing appropriate accommodations.
- Integrate the California Environmental Principles and Concepts into creative learning designs so that all students have access to environment-based learning inside and outside of the classroom.

Strategy 2
California Department of Education Implementation Plan for the CA NGSS

Provide CA NGSS-aligned instructional resources designed to meet the diverse needs of all students.

ELEMENT	AWARENESS	TRANSITION	IMPLEMENTATION
DEVELOPMENT OF THE CA NGSS CURRICULUM FRAMEWORK	CDE will conduct focus groups to draft guidelines for the curriculum framework; IQC recommends guidelines and members for the Curriculum Framework and Evaluation Criteria Committee (CFCC); SBE approves guidelines for development and members of CFCC.	CFCC develops an initial draft framework and presents it to the IQC; IQC conducts a 60-day field review of the Science Framework and makes revisions. IQC takes action to recommend a draft Science Framework to the SBE.	Draft Science Framework is put out for second 60-day field review. IQC examines comments and makes recommendations for additional revisions. SBE acts on Science Framework in January 2016.
UNDERSTAND THE CA NGSS CURRICULUM FRAMEWORK	Contingent on the availability of funds, the CDE, in collaboration with LEAs and stakeholders, develops presentations and workshops to roll-out the Science Framework.	Contingent on the availability of funds, the CDE, in collaboration with LEAs and stakeholders, develop a plan for presenters for regional Science Framework roll-outs.	Contingent on the availability of funds, the CDE, LEAs, and stakeholders participate in the roll-out of the science framework and evaluate the reception of the Science Frameworks; they subsequently revise existing resources and develop additional ones as appropriate.
REVIEW AND SELECT	The IQC recommends and the SBE adopts criteria for evaluating K-8 science instructional	The SSPI recruits instructional materials reviewers (IMRs) and content review experts (CREs) for	The IQC recommends and SBE adopts K-8 science instructional materials in November 2017.

ELEMENT	AWARENESS	TRANSITION	IMPLEMENTATION
INSTRUCTIONAL MATERIALS, INCLUDING HANDS-ON MATERIALS	materials in January 2016.	the review of science materials submitted for SBE adoption consideration.	
	The CDE and IQC, along with LEAs and community stakeholders, explore the needs for materials to implement activities, technology, and lab equipment needed for full implementation at all grade levels.		Contingent on funding, the CDE surveys the field to determine the use of instructional materials, technology, and lab equipment used at grade spans, and teacher responses to materials and resources, and reports out to the SBE the findings and any recommendations.
PROMOTE EQUITY AND ACCESS TO INSTRUCTIONAL RESOURCES	The CDE provides research-based guidance and information for districts to help determine the necessary instructional resources and facilities for equitable, high quality, and safe science instruction which will be presented in the Science Curriculum Framework and the Science Safety Handbook. Work with LEA and stakeholders to identify local and state needs to ensure accessibility to quality resources for all students.		The CDE reviews state needs, evaluates the resources, and revises as needed. Identify possible funding sources and request funding as needed.

Strategy 2
Suggestions and Opportunities for LEAs

- Select and support local representative(s) to attend Science Framework roll-out sessions to plan for local implementation of the CA NGSS and train teacher leaders and curriculum leaders within the LEA to build local capacity for implementation of the CA NGSS.

- Empower teacher leaders and curriculum leaders to provide support at school sites to use the Science Framework as a tool to implement the CA NGSS.

- Use the Science Framework criteria, investigate, evaluate, and select a process for selecting appropriate CA NGSS aligned instructional materials that ensure access to science curriculum for all students, including English learners.

- Use CDE information and resources to determine local needs for equitable, high quality, and safe science instruction for all students, including English learners and students with special needs; prioritize the allocation of the funds for equitable facilities, equipment, and instructional resources to ensure access to science curriculum aligned to CA NGSS for all students, including English learners and students with special needs.

- Research best practices in instructional time, gather data from a local needs assessment to determine local needs for instructional time in science for K–12, and adjust schedules according to the feedback obtained.

- Reach out to local philanthropic and nonprofit organizations and request support through funding, resources, and in kind support.

- Use the NGSS Appendices which were adopted as part of the CA NGSS as a resource and are located at: http://www.cde.ca.gov/pd/ca/sc/ngssstandards.asp.

Strategy 2
Suggestions and Opportunities for Community Stakeholders and Support Providers

- Individually and collaboratively, plan strategies and activities to facilitate the roll-out of the SBE-adopted science framework according to local needs.

- Structure educational services and supports that are aligned to CA NGSS and CA NGSS-aligned instructional materials.

- Determine LEA needs and provide support to facilitate equitable, high quality, and safe science education and education services for all students including English learners and students with special needs.

- Support implementation at the local and state level by providing or securing resources or funding for resources.

Introduction for Strategy 3: Assessment

Develop and transition to CA NGSS-aligned assessments that support the improvement of teaching and learning and provide information that may be used for accountability.

Strategy 3 addresses the development and implementation of high quality, CA NGSS-aligned assessments to ensure that K–12 students in California are prepared to demonstrate the depth of understanding required by the CA NGSS. Successful enactment of this strategy requires collaborative efforts among the CDE, SBE, and various science education community stakeholders.

This strategy reflects a paradigm shift in assessment practice as recommended by the CA NGSS. Emphasis will be on the use of assessment tools, processes, and practices to support teaching and learning and on student performance data for accountability purposes. The successful implementation of the CA NGSS-aligned assessments should include a systemic and systematic approach to assessment that focuses not just on content knowledge, but also on student competency with specific practices and their comprehension of cross-cutting concepts through the integration of the three-dimensional approach (Science and Engineering Practices, Disciplinary Core Ideas, and Cross Cutting Concepts) to understand science and engineering that define the CA NGSS.

Strategy 3 includes the following two elements for the development, implementation, and support of statewide CA NGSS-aligned assessments pursuant to California *EC* Section 60640:

- **Formative Assessment Tools and Processes:** The CDE develops and implements innovative, assessment options such as Formative Assessment Tools and Processes[1], considering grade span, matrix-sampling, performance tasks, and portfolios to augment the ESEA-required summative assessments,.

- **Accountability provisions:** To meet federal accountability provisions under the Elementary and Secondary Education Act (ESEA)[2], the CDE develops and implements innovative statewide, CA NGSS-aligned, Summative Assessments.

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[1] Formative assessment tools and processes may be embedded in instruction and used by classroom teachers to inform their day-to-day practice. Formative assessment data may be used to provide feedback for purposes of adjusting instruction to improve teaching and learning.

[2] Summative assessment data may be used to guide decisions regarding curriculum, professional learning for educators, and to fulfill state and federal accountability requirements.

Proposed Science Assessment Implementation Timeline

July 2014:	Science assessment stakeholder meetings were conducted
2013−14:	ESEA-required CST, CMA, CAPA Science tests were administered in grades 5, 8, and 10
2014–2017:	ESEA-required CST, CMA, CAPA Science tests will be administered in grades 5, 8, and 10
2015–16:	Development of ESEA science assessments and tools aligned to the NGSS are proposed to begin
2016–17:	Pilot Test
2017–18:	Field Test
2018–19:	Operational Test

Strategy 3
California Department of Education Implementation Plan for the CA NGSS

Develop and transition to CA NGSS-aligned assessments that support the improvement of teaching and learning and provide information that may be used for accountability.

ELEMENT	AWARENESS	TRANSITION	IMPLEMENTATION
Development and Implementation of Formative Assessment Tools and Processes	With stakeholder input, the CDE develops a CA NGSS-aligned assessment implementation plan.	The CDE develops criteria to evaluate and repurpose available assessment resources and/or guides the development of new assessment resources (e.g., formative assessment tools and processes). The CDE identifies and develops high-quality CA NGSS-aligned assessment	The CDE develops, pilots, field-tests, operationally administers, and evaluates additional statewide CA NGSS-aligned tests and test administration resources. The CDE provides access to assessment tools and processes needed by the science education community to

ELEMENT	AWARENESS	TRANSITION	IMPLEMENTATION
		resources (e.g., formative assessment tools and processes and performance tasks and scoring rubrics to be used in the classroom to develop and measure students' competency in evidence-based inquiry [designing, conducting, observing, analyzing, and communicating]).	implement formative processes and practices and support summative statewide assessments. The CDE and its contractors develop training materials and conducts local and regional training sessions for assessment administration. The CDE continues to administer statewide CA NGSS-aligned assessments (i.e., ESEA-required tests), administers additional statewide CA NGSS-aligned computer-based tests (i.e., non-ESEA requires tests) if approved by the SBE, and provides test results to parents, schools, LEAs, and counties.
Development and Implementation of Statewide, CA NGSS-aligned, Computer-based Summative Assessments	The CDE holds Science Assessment Stakeholder meetings to collect input regarding CA NGSS-aligned assessments.	The CDE develops recommendations for CA NGSS-aligned assessments considering stakeholder input. The SSPI presents these recommendations to the SBE. The SBE considers and adopts the SSPI recommendations for statewide CA NGSS aligned assessments.	The CDE implements the SBE-adopted CA NGSS assessment recommendations and plan. The CDE develops pilots, field-tests, operationally administers, and annually evaluates new statewide CA NGSS-aligned tests. The CDE administers statewide CA NGSS-aligned computer-based tests and provides test results to students, families, and LEAs.

Strategy 3
Suggestions and Opportunities for LEAs

- Participate in statewide assessment informational and stakeholder meetings. Develop an LEA transition plan to repurpose available local and statewide assessment resources for classroom instruction and new statewide CA NGSS-aligned tests (i.e., ESEA-required tests).

- Evaluate and repurpose available assessment resources and/or guide the development of resources (e.g., formative assessment tools and processes) to inform science instruction.

- Use high-quality sample CA NGSS-aligned assessment resources (e.g., formative assessment tools and processes and performance tasks and scoring rubrics to be used in the classroom to develop student cognitive skills and measure student's competency in evidence-based inquiry [designing, conducting, observing, analyzing, and communicating]) to improve teaching and learning.

- Participate in the state test development process (pilot testing, field testing, item/task scoring, etc.).

- Evaluate LEA technology readiness for CA NGSS-aligned computer-based testing and upgrade infrastructure as needed.

- Use state assessment administration resources (e.g., test administration tools, test scoring and results analysis guides).

- Administer statewide CA NGSS-aligned computer-based tests (i.e., ESEA-required tests and any non-ESEA required tests approved by the SBE) and analyze and use student test data to support the improvement of instruction in the classroom.

Strategy 3
Suggestions and Opportunities for Community Stakeholders and Support Providers

- Participate in statewide assessment informational stakeholder meetings.

- Collaborate with LEAs in local assessment shifts, development, and implementation processes, as agreed upon by the LEA or science education community at large.

- Recommend formative assessment resources for inclusion in the CA NGSS Digital Center for educators and administrators.

- Consider collaborating in developing CA NGSS-aligned resources that address the needs of the California diverse student population.
- Provide funding and resources to support formative processes and performance task opportunities at the local and state level.

Introduction for Strategy 4: Parents and Guardians, Early Childhood, Expanded Learning

Collaborate with parents, guardians, and the early childhood and expanded learning communities to integrate the CA NGSS into programs and activities beyond the K–12 setting.

Strategy 4 addresses the development and implementation of the CA NGSS-aligned collaborations with parents/guardians, the early childhood community, and expanded learning communities to incorporate the CA NGSS into programs and activities beyond the K–12 school setting. Enactment of this strategy requires a collaborative partnership between: the CDE, LEAs, and community stakeholders including but not limited to: parent groups, science centers and museums, county offices of education, professional learning providers, youth clubs/programs, and afterschool programs.

This strategy is designed to develop stakeholder awareness of the messages in the CA NGSS and increase educational opportunities for children during early childhood expanded learning experiences and out-of-school programs for all students in the K–12 system, including students learning English and students with special needs. Science is important for all students as it provides many opportunities for a variety of oral language development, pre-literacy, literacy experiences, and environmental education experiences, including the California Environmental Principles and Concepts (EP&Cs). It also addresses early childhood education (birth to age five), as well as, learning opportunities provided by parents/guardians (e.g., family field trips to science centers, museums, parks, and zoos).

Strategy 4 includes the following elements:

- **Communication**. This element includes developing public understanding of the CA NGSS through outreach initiatives and creating multimedia and multilingual activities and venues. The awareness phase defines a common understanding of the CA NGSS; the transition phase delineates collaborative action steps to work towards the CA NGSS implementation; the implementation phase includes broadening awareness; developing and revising plans; and measuring effectiveness.

- **Products and Tools**. This element includes collaborative development of a variety of multimedia and multilingual tools. These tools include web portals, PowerPoint presentations, newsletter templates, tip sheets, moments of science, careers, science in the environment, and hands-on modules and science kits for use by early childhood service providers, parents, and after school clubs. The products and tools are disseminated and revised based on feedback.

- **Resources**. This element defines the collaborative role of the CDE, LEAs, and community stakeholders to identify available resources and innovative programs for targeted audiences aligned to CA NGSS, such as those related to

science, technology, engineering, and mathematics (STEM), and environment-based education. The element also identifies and disseminates promising and innovative practices to various audiences.

Strategy 4
California Department of Education Implementation Plan for the CA NGSS

Collaborate with parents, guardians, and the early childhood and expanded learning communities to integrate the CA NGSS into programs and activities beyond the K–12 setting.

ELEMENT	AWARENESS	TRANSITION	IMPLEMENTATION
COMMUNICATION	The CDE, in collaboration with LEAs and community stakeholders, seeks resources to develop a multi-media, multi-lingual public information outreach initiative about the CA NGSS differentiated for: ○ Parents and guardians ○ Early childhood communities ○ Expanded learning communities ○ Other settings outside of the K–12 community.	The CDE, in collaboration with LEAs and community stakeholders disseminates multi-media, multi-lingual public information about the CA NGSS differentiated for specific target audiences, including: ○ Parents and guardians ○ Early childhood communities ○ Expanded learning communities ○ Other settings outside of the K–12 community.	

ELEMENT	AWARENESS	TRANSITION	IMPLEMENTATION
PRODUCTS AND TOOLS	The CDE works with LEAs and community stakeholders beyond the K–12 setting to determine product and tool needs to support awareness of CA NGSS for: ○ Parents and guardians ○ Early childhood communities ○ Expanded learning communities ○ Other settings outside of the K-12 community.	The CDE works with LEAs and community stakeholders beyond the K-12 setting to identify, develop, and disseminate products and tools to support transition to and implementation of CA NGSS for: ○ Parents and guardians ○ Early childhood communities ○ Expanded learning communities ○ Other settings outside of the K–12 community.	
RESOURCES	The CDE researches resource opportunities to support innovative CA NGSS programs for: ○ Parents and guardians ○ Early childhood communities ○ Expanded learning communities ○ Other settings outside of the K–12 community.	The CDE distributes information about resource opportunities to support innovative CA NGSS programs for: ○ Parents and guardians ○ Early childhood communities ○ Expanded learning communities ○ Other settings outside of the K–12 community.	

Strategy 4
Suggestions and Opportunities for LEAs

- In collaboration with CDE and community stakeholders, seek resources to develop and disseminate a multi-media, multi-lingual public information outreach initiative about the CA NGSS differentiated for: parents and guardians, early childhood communities, expanded learning communities, and other settings outside of the K–12 community.

- In collaboration with CDE and community stakeholders beyond the K–12 setting, identify, develop, and disseminate products and tools to support transition to CA NGSS for: parents and guardians, early childhood communities, expanded learning communities, and other settings outside of the K–12 community.

- Identify possible resource opportunities for education programs beyond the K–12 setting, and partner with community stakeholders to apply for resources and possible grant opportunities offered through philanthropic and non-profit organizations.

Strategy 4
Suggestions and Opportunities for Community Stakeholders and Support Providers

- In collaboration with CDE and LEAs, seek resources to develop and disseminate a multi-media, multi-lingual public information outreach initiative about the CA NGSS differentiated for: parents and guardians, early childhood communities, expanded learning communities, and other settings outside of the K–12 community.

- In collaboration with CDE and LEAs, identify, develop, and disseminate products and tools to support transition to CA NGSS for: parents and guardians, early childhood communities, expanded learning communities, and other settings outside of the K–12 community.

- Consider identifying, developing, and/or providing statewide and regional training opportunities, including but not limited to conferences, webinars, online tutorials, and workshops aligned to CA NGSS and differentiated for: parents and guardians, early childhood communities, expanded learning communities, and other settings outside of the K–12 community.

- Identify possible resource opportunities for education programs beyond the K–12 setting, and partner with LEAs to apply for resources and possible grant opportunities.

Introduction for Strategy 5: Postsecondary and Business Communities

Collaborate with the postsecondary and business communities and additional stakeholders to ensure that all students are prepared for success in career and college.

Strategy 5 addresses the collaboration with the postsecondary and business communities and additional stakeholders to ensure that all students are prepared for success in career and college through effective science instruction. Enactment of this strategy requires a collaborative partnership between the CDE, LEAs, and community partners, including but not limited to: business and industry, institutes of higher education, teacher preparation programs, parent groups, professional learning providers, professional associations, and nonprofit organizations.

This strategy is designed to establish networks of interested partners to ensure student preparation for career and college options and to communicate with stakeholders how the CA NGSS relates to student success. The strategy also addresses the intersections of the CA NGSS with the 2013 Career Technical Education Model Curriculum Standards (CTE Standards); and makes connections to cultural nuances that help bridge science education programs with business and industry needs.

Strategy 5 includes the following elements:

- **Identify Existing and Establish New Networks**. This element includes the establishment of networks at the state, local, and regional levels. Throughout the implementation phases, this element also builds and expands on existing networks; enabling the linkage between the CA NGSS and career and college readiness.

- **College and Career Pathways**. This element addresses the relationship between the CA NGSS and the CTE Standards and how this synergistic relationship can be used to address 21st century skills and career and college goals at the local level. The topic also addresses the use of identified resources (people and programs) to facilitate college and career exploration and preparation for science, engineering, and technology fields for all students, including English language learners and students with special needs.

Strategy 5
California Department of Education Implementation Plan for the CA NGSS

Collaborate with the postsecondary and business communities and additional stakeholders to ensure that all students are prepared for success in career and college.

ELEMENT	AWARENESS	TRANSITION	IMPLEMENTATION
IDENTIFY EXISTING AND ESTABLISH NEW NETWORKS	The CDE identifies institutes of higher education and other community stakeholders interested in ensuring that all students, including English learners and students with special needs, are prepared for career and college.	The CDE participates in local, statewide, multi-state, and national discussions to convey the importance of high quality science education as part of ensuring that all students are prepared for career and college.	The CDE collaborates with relevant community stakeholders to support and promote high quality science education as an integral part of college and career preparation.
COLLEGE AND CAREER PATHWAYS	Contingent on available funds, the CDE develops a document that identifies the relationship of the CA NGSS with the CTE Standards to 21st century skills and college and career goals. The CDE identifies resources to facilitate college and career exploration and preparation in science, engineering, and technology fields.	Contingent on available funds, the CDE disseminates the document, and provides briefings and professional learning opportunities, to describe the relationship of the CA NGSS and the CTE Standards to 21st century skills and college and career goals. The CDE posts, on the CA NGSS Digital Center, information regarding resources for college and career exploration and preparation in science, engineering, and technology fields.	The CDE works with teacher preparation programs to ensure that academic and CTE teacher candidates across the state have information and strategies necessary to include the CA NGSS in their programs of study. Contingent on available funding, the CDE provides training in the access and use of resources on CA NGSS Digital Center to facilitate college and career exploration and preparation in science, engineering, and technology fields.

Strategy 5
Suggestions and Opportunities for LEAS

- Develop partnerships with Institutes of Higher Education and other community partners to ensure that every student has a comprehensive science education in preparation for college and careers in the 21st century.

- Collaborate with community partners to provide information, resources, and professional learning opportunities to facilitate familiarity with and infusion of CA NGSS in their programs.
- Understand the intersections of the CA NGSS with the CTE Standards in relation to 21st century skills and college and career goals.
- Work with community partners to develop articulated pathways, and research other possible infrastructures so that all students will have the opportunity to pursue college and careers in science, technology, and engineering fields.

Strategy 5
Suggestions and Opportunities for Community Stakeholders and Support Providers

- Participate in discussions to ensure all students are prepared for college and career in the 21st century.
- Provide opportunities for teachers and students to participate in the workplace to enhance their 21st century job skills relating to science, technology, and engineering.
- Understand the intersection of CA NGSS and the needs of a modern workforce.
- Provide training to LEAs relating to college and career exploration in science, technology, and engineering.

Introduction for Strategy 6: Resources

Seek, create, and disseminate resources to support stakeholders as the CA NGSS implementation moves forward.

Strategy 6 addresses ways to seek, create, and disseminate resources to support stakeholders throughout and beyond the implementation phase of the CA NGSS. Enactment of this strategy requires a collaborative partnership between and among the CDE, LEAs, and community partners.

This strategy describes a multi-tiered approach to ensure purposeful identification, development, and dissemination of resources to implement the CA NGSS. The term "resources" is used to describe time, people, funding, physical materials including facilities to provide science and engineering teaching and learning experiences, intellectual materials, and community resources.

Strategy 6 includes the following element:

- **Seek, Create, and Disseminate Resources**. This element provides a set of activities for the CDE, LEAs, and community stakeholders. During the awareness phase, the CDE identifies, develops, and disseminates resources aligned to the CA NGSS to meet the needs of California's diverse constituency. During the transition phase, resources are modified, obtained, and created to address stakeholder needs. The focus in the implementation phase is to ensure sustainability of instructional strategies and build capacity at the classroom level throughout all phases of implementation.

This element also describes a mechanism for resource dissemination through the creation and maintenance of the CA NGSS Digital Center referenced in other strategies of this *Plan*. Key features of the CA NGSS Digital Center include:

- A secure interactive platform
- Options for uploading and downloading resources
- User reviews
- Accessible by all stakeholders

Strategy 6
California Department of Education Implementation Plan for the CA NGSS

Seek, create, and disseminate resources to support stakeholders as the CA NGSS implementation moves forward.

ELELMENT	AWARENESS	TRANSITION	IMPLEMENTATION
SEEK, CREATE, AND DISSEMINATE RESOURCES	The CDE, in partnership with various stakeholders, identifies public and private resources to support CA NGSS implementation. The CDE, in collaboration with stakeholders, identifies CA NGSS implementation gaps and needs.	Contingent on available funding, CDE in partnership with LEAs and community stakeholders establishes and develops protocols for the Digital Center, a secure online mechanism to gather, review, and share CA NGSS resources. The CDE and stakeholders research appropriate public and private resources and strategies to meet those needs.	Contingent on available funding, the CDE disseminates information through the Digital Center regarding CA NGSS implementation resources (public and private) that meet the diverse needs of California students and schools. The CDE accesses available public and private resources and seeks funding to develop new resources, to meet identified CA NGSS implementation gaps and needs.

Strategy 6
Suggestions and Opportunities for LEAs

- Evaluate local resource needs for CA NGSS implementation.
- Identify public and private resources to support the implementation of CA NGSS.
- Provide appropriate resources at the local level for CA NGSS implementation.
- Create resources to enhance public awareness regarding CA NGSS.
- Post public awareness materials to NGSS web sites and CA NGSS Digital Center.
- Develop local incentive program to recognize teachers who create exemplar materials related to CA NGSS.

- Work with the CDE to establish protocols for CA NGSS Digital Center resources.

Strategy 6
Suggestions and Opportunities for Community Stakeholders and Support Providers

- Work with LEAs to develop materials related to CA NGSS.
- Identify and allocate public and private resources to support LEAs in the implementation of CA NGSS.
- Build interagency awareness regarding CA NGSS resources and resource needs.
- Seek feedback from LEAs regarding resources, and modify as needed.
- Work with the CDE to establish protocols for CA NGSS Digital Center resources.

Introduction for Strategy 7: Communication

Design and establish systems of effective communication regarding CA NGSS among stakeholders to continuously identify areas of need and disseminate information.

Strategy 7 addresses the design and establishment of effective communication systems among stakeholders to continuously disseminate information to meet the needs of various stakeholders throughout the CA NGSS implementation. Based on lessons learned while implementing the CA CCSS, this element is most important since providing the public with an understanding of CA NGSS will assist in gaining public support. Enactment of this strategy requires a collaborative partnership between and among the CDE, LEAs, partners, and community stakeholders.

This strategy addresses two overarching communication needs. First is the need for a multi-media communication system and associated tools. This system would include a CA NGSS Digital Center that supports Strategies 1–6, and provides a two-way communication system among stakeholder groups that is contingent on available funds. The second need is for a public outreach, awareness, and education campaign for all stakeholders that informs and promotes the benefits of the CA NGSS.

Strategy 7 includes the following elements:

- **Communication Tools**. This element identifies necessary communication tools and systems to effectively implement Strategies 1–6. It also addresses the need for public awareness tools such as multi-media (e.g. web-based as well as face to face, social-media, printed materials, videos, webinar, and TV) be included for all stakeholders. This section addresses the development of a CA NGSS Digital Center on which resources for teaching, learning, and stakeholder understanding of the CA NGSS may be posted. This CA NGSS Digital Center would be housed on the "My Digital Chalkboard" Web site at https://www.mydigitalchalkboard.org/, sponsored by the State of California with the support from the Californians Dedicated to Education Foundation. This portal is intended to be a secure interactive central repository with options for uploading and downloading resources, use of search engines, user reviews, and access by all stakeholders. Additional features may include: community spaces, options for resources organized by region, and posting of public awareness materials. Development of this CA NGSS Digital Center is contingent upon availability of sufficient funding.

- **Communication Outreach**. This element addresses the development of a public awareness campaign to inform stakeholders of developments and resources in the implementation of the CA NGSS, encourage use of the CA NGSS Digital Center, and use of the communication system for successful implementation and support of CA NGSS.

Strategy 7
California Department of Education Implementation Plan for the CA NGSS

Design and establish systems of effective communication regarding CA NGSS among stakeholders to continuously identify areas of need and to disseminate information.

ELEMENT	AWARENESS	TRANSITION	IMPLEMENTATION
COMMUNICATION TOOLS	The CDE, in collaboration with stakeholders and web developers, researches options for creating a Web site for CA NGSS resources and communications, entitled the CA NGSS Digital Center.	The CDE works with stakeholders and web developers to create the CA NGSS Digital Center to be located on the "My Digital Chalkboard" Web site, sponsored by the CDE.	The CDE posts resources, communications, and public awareness materials on the CA NGSS Digital Center and continually updates the materials on this Web site.
	Working with Achieve and other states who have adopted NGSS the CDE, in collaboration with stakeholders, identifies necessary communication tools such as face-to-face, social media, printed materials, videos, and webinars in support of research-based CA NGSS implementation strategies.	Contingent on available funding, the CDE, in collaboration with stakeholders, develops materials and tools for communication, disseminates them through appropriate multi-media and face to face venues, and collects feedback on their effectiveness and usefulness.	The CDE continually adapts and refines communication materials, tools, and systems based on research, identified needs, and feedback from stakeholders.
COMMUNICATION OUTREACH	Contingent on funding, and working with Achieve, who is leading the multi-state efforts and other states who have adopted NGSS, the CDE designs a multi-	Contingent on available funding, the CDE, in collaboration with all stakeholders, facilitates implementation, evaluation, and continuous improvement of the outreach campaign.	

ELEMENT	AWARENESS	TRANSITION	IMPLEMENTATION
	media outreach campaign to inform all stakeholders about CA NGSS, engages them in the process of implementation, and advises them of available resources.		

Strategy 7
Suggestions and Opportunities for LEAs

- Identify resources that have been effective in the implementation of CA NGSS and submit these to CDE for consideration for posting on the CA NGSS Digital Center.
- Encourage use of the CA NGSS Digital Center by teachers, administrators, parents, business and community partners, and other stakeholders.
- Develop and implement a local awareness campaign about the CA NGSS and encourage dialogue, understanding, and support of CA NGSS.
- Include use of CA NGSS Digital Center tools and communications system in local CA NGSS implementation plans.

Strategy 7
Suggestions and Opportunities for Community Stakeholders and Support Providers

- Identify resources that would assist in communication about, and implementation of, CA NGSS and submit these to CDE for consideration for posting on the CA NGSS Digital Center.
- Encourage use of the CA NGSS Digital Center by community stakeholders.
- Develop and implement a local awareness campaign about the CA NGSS and encourage dialogue, understanding, and support of CA NGSS.

Introduction for Strategy 8: Coalition Building

Build coalitions to ensure a consistent message and to sustain momentum during CA NGSS implementation.

Strategy 8 addresses the design and implementation of coalitions of people who have joined together for the common purpose of supporting the quality implementation of the CA NGSS. The enactment of this strategy requires a collaborative partnership between the CDE, LEAs, expanded learning professionals, and local community stakeholders including but not limited to: business and industry, county offices of education, professional learning providers, institutes of higher education, professional organizations, science centers and museums, science informal education providers, public media providers, and other partners.

This strategy represents statewide and community advocacy including parents, business, and other interested community members as well as educators. The purpose of coalition building is to provide momentum and develop consistent messages and information that is responsive to the needs at all levels: state, regional, and local. The messages are tailored to a variety of audiences to build understanding, foster interest, and lay the foundation for broad support of the quality implementation of the CA NGSS.

Strategy 8 includes the following elements:

- **Coalition Building and Coalition Purpose**: This element addresses the identification and establishment of coalitions and their members over the course of the CA NGSS implementation and beyond. The coalitions are viewed as changing and expanding entities with multiple and diverse members who have vested interests in the effective implementation of the CA NGSS. This element addresses coalitions at the state and local levels and describes how community stakeholders can inform and support each other.

- **Dissemination of Consistent Messaging**: This element addresses the need for consistent messaging across the state tailored to targeted audiences. The messages will need to be responsive to the changing needs throughout the implementation phases of the CA NGSS and will be relevant to the state, regional, and local contexts. Further, the messages will be data driven and support components of the system (e.g., professional learning, instructional materials, assessments, resources, and funding) that are necessary for quality implementation. Dissemination of the coalitions' advocacy messages will ensure universal and high quality implementation of the CA NGSS by all stakeholders and the messages will be modified and refined as needed and appropriate by the coalition.

Strategy 8
California Department of Education Implementation Plan for the CA NGSS

Build coalitions to ensure a consistent message and to sustain momentum during CA NGSS implementation.

ELEMENT	AWARENESS	TRANSITION	IMPLEMENTATION
COALITION BUILDING AND PURPOSE	Contingent on available funding, the CDE, along with multiple interested stakeholders, identifies an inclusive strategy to invite interested entities to join an expanded state coalition to ensure effective implementation of the CA NGSS at the State and local levels.	Contingent on available funding, the CDE along with interested stakeholders, convenes an initial coalition meeting to establish meeting schedules and determine governance of the coalition and further define the role and function of the coalition.	Contingent on available funding, the CDE participates as a partner in the coalition, developing messages regarding professional learning, instructional materials, assessments, resources, and funding. The coalition will also identify model program achievements statewide and help recruit and identify new coalition members as needed.
DISSEMINATION OF CONSISTENT MESSAGING	Contingent on availability of funds, the CDE will work with the coalition members to begin to identify and prioritize CA NGSS implementation issues that need to be addressed at the local and statewide levels.	Contingent on availability of funds, the CDE will work with the coalition to better understand the scope and depth of statewide implementation. The coalition will leverage the expertise and resources of its members and develop consistent messaging for dissemination to multiple audiences regarding the CA NGSS.	Contingent on availability of funds, the CDE, as a partner in the coalition, will continue to develop and refine messaging for multiple audiences regarding the CA NGSS implementation to sustain momentum and ongoing coalition activities and initiatives. The coalition members will also evaluate the effectiveness of its dissemination efforts.

Strategy 8
Suggestions and Opportunities for LEAs

- Establish local coalitions regionally with nearby LEAs, businesses, and philanthropic and non-profit organizations to build capacity and provide support for identified implementation needs and challenges. Local coalitions can provide activities and messaging to assist the local community in better understanding the CA NGSS.

- Local coalitions gather local and state data to craft consistent messages for targeted local audiences that outline the scope and depth of implementation and the needs for sustaining implementation within the community.

- Each local coalition helps develop and disseminate materials for multiple audiences around the CA NGSS implementation, continues to advocate for quality implementation, and leverages the expertise of the coalition to sustain ongoing coalition activities and initiatives.

Strategy 8
Suggestions and Opportunities for Community Stakeholders and Support Providers

- Work with local LEAs to establish local coalitions regionally with businesses and philanthropic and non-profit organizations to build capacity and provide support for identified implementation needs and challenges. Local coalitions can provide activities and messaging to assist the local community in better understanding the CA NGSS.

- Community stakeholders identify possible funding streams for CA NGSS implementation and collaborate with CDE and LEAs to participate in statewide and local coalitions focused on high quality CA NGSS implementation and to identify potential state and local coalition members.

- Community stakeholders collaborate with other coalition members to gather local and state data to craft consistent messages for target audiences that outline the scope and depth of CA NGSS implementation and the needs for sustaining implementation.

- Community stakeholders collaborate with members of the coalition to help develop and disseminate messaging materials for multiple audiences, to advocate for the components required for successful implementation of the CA NGSS, as they leverage the expertise of the coalition to sustain ongoing activities and initiatives.

Appendix A: Next Generation Science Standards Resources

The following is an initial list of resources that may be useful to support teachers, administrators, support providers, and other partners as they begin to implement the Next Generation Science Standards

California Department of Education Resources

- A Blueprint for Great Schools: http://www.cde.ca.gov/eo/in/bp/documents/yr11bp0709.pdf
- *A Look at Kindergarten Through Grade Six, and Grades Seven and Eight, in California Public Schools:* http://www.cde.ca.gov/ci/cr/cf/grlevelcurriculum.asp
- A Vision for Expanded Learning in California, Strategic Plan 2014–2016: https://www.cde.ca.gov/ls/ex/documents/exldstrategicplan.pdf
- Alignment of the Preschool Learning Foundations: http://www.cde.ca.gov/sp/cd/re/psalignment.asp
- California Discipline Specific Model for Grades 6–8: http://www.cde.ca.gov/pd/ca/sc/ngssstandards.asp
- California Assembly Bill 899 – Webber; English Language Development Standards: http://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201320140AB899
- California Code of Regulations – Title 5: Article 4 School Facilities: http://www.cde.ca.gov/ls/fa/sf/title5regs.asp
- California Career Resource Network: http://www.californiacareers.info/
- California ELD Standards Resources: http://www.cde.ca.gov/re/cc/eldresources.asp
- California Environmental Principles and Concepts: http://www.californiaeei.org/abouteei/whatistaught/epc/
- California Preschool Learning Foundations: http://www.cde.ca.gov/sp/cd/re/psfoundations.asp
- California Science Curriculum Frameworks Web site: http://www.cde.ca.gov/ci/sc/cf/
- California Science Safety Handbook: http://www.cde.ca.gov/pd/ca/sc/documents/scisafebook2014.pdf

- Career Technical Education Model Curriculum (CTE) Standards: http://www.cde.ca.gov/ci/ct/sf/ctemcstandards.asp
- Common Core State Standards Web site: http://www.cde.ca.gov/re/cc/
- Family Engagement Framework, A Tool for California School Districts (2011): http://www.wested.org/online_pubs/cpei/family-engagement-framework.pdf
- Greatness By Design: Supporting Outstanding Teaching to Support a Golden State: http://www.cde.ca.gov/eo/in/documents/greatnessfinal.pdf
- Innovate - A Blueprint for Science, Technology, Engineering, and Mathematics in California Public Education: http://www.cde.ca.gov/pd/ca/sc/documents/innovate.pdf
- Next Generation Science Standards (NGSS) Web Site: http://www.cde.ca.gov/pd/ca/sc/ngssintrod.asp
- Professional Development Opportunity Search Form: http://www.cde.ca.gov/pd/te/ce/prodev07intro.asp
- Recommendations for Transitioning California to a Future Assessment System: (This link is no longer valid and has been removed.)
- SMARTER Balanced Assessment Consortium Web Page: http://www.cde.ca.gov/ta/tg/sa/smarterbalanced.asp
- Superintendent's Quality Professional Learning Standards: http://cacompcenter.org/wp-content/uploads/2014/05/QPLS-Preview-Copy_052014.pdf

National Resources

- Climate Literacy: The Essential Principles of Climate Science Web Site:
  (This link is no longer valid and has been removed.)
- Common Core State Standards Initiative Web Site: http://www.corestandards.org/
- *Developing Assessments for the Next Generation Science Standards* a report by the National Research Council is available at: http://www.nap.edu/catalog.php?record_id=18409.
- Next Generation Science Standards (NGSS) Web Site: http://www.nextgenscience.org/
- Ocean Literacy: The Essential Principles and Fundamental Concepts of Ocean Sciences for Learners of All Ages Web Site: http://oceanliteracy.net/
- Ocean Literacy Scope and Sequence for Grades K-12: http://oceanliteracy.wp2.coexploration.org/
- SMARTER Balanced Assessment Consortium Web Site: http://www.smarterbalanced.org/
- Student Achievement Partners: http://www.achievethecore.org/

Organizations, Initiatives, and Web-Based Resources:

- Association of California School Administrators: http://www.acsa.org/
- Achieve, Inc.: http://achieve.org/
- BaySci: A Partnership for Bay Area Science Education Web Site: http://www.baysci.org
- California County Superintendents Educational Services Association: http:/ccsesa.org/
- California Environmental Education Interagency Network: http://www.coastal.ca.gov/publiced/ceein
- California School Boards Association: http://www.csba.org/

- California Science Teachers Association: http://www.cascience.org/
- California Science Project: http://csmp.ucop.edu/csp
- California State PTA: http://www.capta.org/
- California STEM Learning Network: https://www.childrennow.org/castemnetwork/
- Change the Equation: (This link is no longer valid and has been removed.)
- Click2Science PD: http://www.click2sciencepd.org/
- K-12 Alliance/WestEd: http://www.wested.org/project/k-12-alliance/
- My Digital Chalkboard: https://www.mydigitalchalkboard.org/
- National Association for the Education of Young Children: http://www.naeyc.org/
- National Science Teachers Association: http://www.nsta.org/
- Performance Assessment Links in Science (PALS), National Science Education Standards: http://pals.sri.com/
- STEM ^{2} The Power of Discovery: http://powerofdiscovery.org/
- STEMx Sustainability Compass (rubric): http://www.stemx.us/
- The Coalition for Science Afterschool: http://www.informalscience.org/coalition-science-after-school
- The Public Broadcasting System, Science and Nature: http://www.pbs.org/topics/science-nature/

Articles, Books, and Research

- Achieve, Inc. (2014). Educators Evaluating Quality Instructional Products (EQuIP) Rubric: http://www.achieve.org/EQuIP
- Bybee, Roger W. (2013). Translating NGSS for Classroom Instruction: https://www.nsta.org/store/product_detail.aspx?id=10.2505/9781938946011
- Coggshall, Jane G. (2012). Toward the Effective Teaching of New College- and Career-Ready Standards: Making Professional Learning Systemic: http://www.gtlcenter.org/sites/default/files/docs/TowardEffectiveTeaching.pdf
- Council of the Great City Schools (2013). Communicating the Common Core State Standards, A Resource for Superintendents, School Board Members, and Public Relations Executives: http://www.cgcs.org/cms/lib/DC00001581/Centricity/Domain/4/FINAL%20Communicating%20Common%20Core%2011.13.pdf
- Hess, Jones, Carlock, and Walkup (2009).Cognitive Rigor: Blending the Strengths of Bloom's Taxonomy and Webb's Depth of Knowledge to Enhance Classroom-level Processes: http://standardsco.com/PDF/Cognitive_Rigor_Paper.pdf
- *INNOVATE A*: *Blueprint for Science, Technology, Engineering, and Mathematics in California Public Education,* (2014): http://www.cde.ca.gov/eo/in/stemtf.asp
- Loucks-Horsley, Love, Stiles, Mundry, and Hewson, (2003). Designing Professional Development for Teachers of Science and Mathematics Corwin, Thousand Oaks CA.
- National Research Council (2011). Successful K–12 Stem-Education: (This link is no longer valid and has been removed.)
- National Research Council (2013). *Developing Assessments for the Next Generation Science Standards*. Washington, DC: The National Academies Press.

- Pratt, Harold (2012). The NSTA Reader's Guide to A Framework for K–12 Science Education: Second Edition: Practices, Crosscutting Concepts, and Core Ideas, NSTA Press.

- Reiser, Brian (2013). What Professional Development Strategies Are Needed for Successful Implementation for the Next Generation Science standards?
  http://www.academia.edu/5885503/
  What_Professional_Development_Strategies_Are_Needed_for_Successful_Implementation_of_the_Next_Generation_Science_Standards

Appendix B: Acronyms

ACSA	Association California School Administrators
CCC	Crosscutting Concepts
CCSS	Common Core State Standards
CDE	California Department of Education
COE	County Office of Education
CSBA	California Board School Association
CSP	California Science Project
CSTA	California Science Teacher Association
CTC	California Commission on Teacher Credentialing
CTE	Career Technical Education
DCI	Disciplinary Core Ideas
ETS	Engineering and Technology Standards
ILP	Individual Learning Plan
LCAP	Local Control Accountability Plan
LCFF	Local Control Funding Formula
LEA	Local Educational Agency
NGSS	Next Generation Science Standards
PEM	Program Elements Matrix
PL	Professional Learning
PLC	Professional Learning Community
PLM	Professional Learning Module
RFA	Request For Application
SEP	Science and Engineering Practices
SQPLS	Superintendent's Quality Professional Learning Standards

Appendix C: CA NGSS Initiatives of Stakeholder Organizations

The challenge of integrating the *Next Generation Science Standards for California Public Schools, Kindergarten through Grade Twelve* (CA NGSS) into all facets of teaching and learning presents an opportunity for California to engage in a collaborative process wherein a community of educational partners can provide educators with the tools and support necessary to ensure successful implementation.

To this end, the California Department of Education invited professional associations and stakeholder organizations to contribute information regarding the CA NGSS related resources and services they can offer to local educational agencies. The information in this Appendix was provided by these partners for inclusion in Next Generation Science Standards Systems Implementation Plan for California specifically to highlight how these organizations can assist local educational agencies in implementing the CCSS.

County Offices of Education Service Offerings – California County Superintendents Educational Services Association (in alphabetical order)

- Fresno County Office of Education [http://www.fcoe.org/]
  - The Fresno County Office of Education supports strong academic programs, career technical education, and the arts as we work to create a culture-rich society where the whole child is important. FCOE will continue to provide support to meet the challenges of the 21st Century and help our students become successful in the new global economy.
    County offices of education are the intermediate level of the public education system in California. Serving 34 school districts and more than 190,000 students, Fresno County Office of Education has a legislative mandate to ensure that school districts remain fiscally solvent and in compliance with state and federal laws. Moreover, county offices serve as a safety net for students with special needs, offering direct services for migrant, special education, and court and community schools students.

  - Professional Development for NGSS:
    - Understanding NGSS and the Engineering Practices
    - Creating an NGSS Scope and Sequence
    - Teaching in an NGSS Classroom

- Conceptual Flow Mapping of the Core Ideas of CA-NGSS
- Scientific Notebooks: Engaging Students in Meaningful Thought Processes
- Modeling with CCSS-Math and NGSS
- Professional Learning Science Communities for Rural Schools
- Professional Learning and Academic Coaching: The Recursive Cycle

  Contact: Jennifer Weibert, Science Coordinator, Fresno County Office of Education

❖ Los Angeles County Office of Education [http://www.lacoe.edu/Home.aspx]

- Under the leadership of Los Angeles County Superintendent of Schools, Arturo Delgado, and the County Board of Education, the Los Angeles County Office of Education (LACOE) supports 80 public school districts and numerous other agencies in ensuring educational excellence for the region's two million preschool and school-age children. LACOE's STEM Unit provides tools, workshops, and consultative services for teachers and administrators in the area of Science, Mathematics and STEM/STEAM Education. The STEM Unit works in collaboration with multiple organizations to provide information and resources that support educators in learning more about the Next Generation Science Standards.
- Science education and Field Study: http://www.lacoe.edu/CurriculumInstruction/ScienceEdFieldStudy.aspx
- Curriculum and Instructional Services 2014–2015 Professional Development Offerings: http://tinyurl.com/cispd1415
- Implications of Common Core State Standards in the Science Classroom
- STEM In the Elementary Classroom/STEM in the Secondary Classroom
- NGSS Awareness Trainings
- NGSS Content Institutes

- Quarterly Science Leaders Network Meetings
    - Separate Elementary, Middle, and High School meetings.
- Conceptual Flow Mapping and the 5E Learning Cycle
- Lesson Studies
- Science Literacy

  Contact: Anthony P. Quan, Consultant II, STEM, Los Angeles County Office of Education, Division of Curriculum and Instruction, phone 562-922-6896

❖ Orange County Department of Education [http://ocde.us/Pages/default.aspx]

- Science Professional Learning: [https://ocde.us/EducationalServices/STEMandHumanities/STEM/Pages/Science.aspx]
- Through various programs, workshops, symposia, and community activities, the Science/STEAM Unit at the Orange County Department of Education strives to improve academic achievement, scientific literacy, classroom instructional practices and leadership strategies for students, teachers and administrators. The Science Unit offers on-going professional learning opportunities for teachers and administrators, focused on the specific needs of the schools in the 28 districts located in Orange County. All workshops can be customized to meet specific needs of your district.
- A nine-session NGSS Awareness Series, these workshops will focus on the National Research Council's A Framework for K-12 science education and the development, intent, design and instructional shifts of the Next Generation Science Standards (NGSS) adopted by California.
- A six-session series, these workshops will focus on unpacking each of the NGSS appendices and making connections to how they can be used to scaffold implementation in your classroom.

- A three-day intensive training, coupled with a classroom coaching model, on a newly developed Instructional Unit Planning Tutorial, *NGSS Instructional Unit Planning Kit*--teachers will use a step-by-step process for unit development using the newly adopted Next Generation Science Standards, and a template for electronically recording each step, using the research-based Wiggins model of backwards mapping design. This workshop will help teachers think and plan differently as they integrate into their instructional unit the three dimensions of NGSS, namely the Science and Engineering Practices, Disciplinary Core Ideas and Crosscutting Concepts.

- A three-session series, these trainings are designed to provide K-12 teachers of science with valuable information, resources, and strategies to integrate the Common Core State Standards for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects in their classrooms. Presenters will provide an overview of the Common Core State Standards; discuss connections between Common Core, Habits of Mind and inquiry-based science instruction; learn how to help students read and comprehend informational text and how to write effectively to communicate deeper understanding of science content.

- A four-session series, these trainings are designed to introduce you to the engineering design process and why it is such an essential dimension of Next Generation Science Standards. Additionally, as a participant, successful completion of this series will qualify you as a district trainer for the curriculum, *Engineering Is Elementary*.

- A two-session series, join presenters as we explore Science Fairs and Science Olympiad as two opportunities to support STEM learning. Science Fairs are an excellent way to introduce your students to STEM, incorporate Common Core standards, and jump-start an interdisciplinary Project Based Learning unit. Science Olympiad is a perfect STEM and integrated curriculum entry point. It is a fun and engaging way of getting STEM started at your school.

  Contact: Dean Gilbert, Science/STEAM Coordinator, Orange County Office of Education, Office of Academic Content, Science/STEAM Unit, phone 714-966-4291, dgilbert@ocde.us

- Riverside County Office of Education [http://www.rcoe.us/]
  - The Riverside County Office of Education (RCOE) provides specific educational, financial, legislative, and leadership services and support to all K-12 school districts in Riverside County.
  - Instructional Services (IS) facilitates and supports a proven systems change, continuous improvement model, designed to assist schools/districts aspiring to improve academic achievement for ALL students.
  - The Riverside County Office of Education's STEM Center is dedicated to helping our county's school administrators and teachers implement engaging STEM curriculum in the classroom. http://www.rcoe.us/educational-services/instructional-services/rcoe-stem-center/
  - NGSS Awareness Series:
    - Administrator Strand
    - NGSS 101
    - NGSS 102
    - Performance Expectations
    - Implementation Tool
    - Connecting NGSS and CCSS
    - Middle School Progression
    - Model Lesson Exploration
  - District Science Leadership Network meetings

- STEM Leadership Networking meetings
- Environmental Education Initiative Trainings
- Science Fair Expo: A Focus on Research
- NGSS Transition Series
- NGSS Implementation Series
- Notebooking: A Powerful Pedagogical Tool

  Contact: Yamileth Shimojyo, Coordinator, Instructional Services, Division of Educational Services, Riverside County Office of Education, phone 951-600-5658

❖ San Bernardino County Superintendent of Schools [http://www.sbcss.k12.ca.us/]

- NGSS Awareness Series - Building Understanding of NGSS and the Changes in Science Education
  - NGSS 101 and 102 - Getting to know NGSS, its Architecture and Dimensions
  - Exploring and Planning for Middle School Science
  - Exploring and Planning for Elementary Science
  - Performance Expectations and the Impact on Assessment
  - Exploring and Building Model Lessons
  - Dividing Deeper into the Science and Engineering Practices

- CCSS and NGSS Series
    - Literacy in Science
    - Building Connections Between CCSS and NGSS – Mathematics
    - Science Fair Projects - A Collision of CCSS and NGSS
- Awareness to Transition Workshops: Planning for NGSS Implementation
- Environmental Education
    - Building Student Connections to NGSS through Environmental Education
    - EEI Curriculum Unit Training
    - Implementing EEI Curriculum in Career Pathways
- Building Administrative Support for NGSS Implementation
    - A Conversation on NGSS Awareness for Administrators
    - A Conversation on NGSS Transition for Administrator
    - District Science Leadership Network - Building Connections for Science Leaders

Contact: Linda- Bratz-Brown, Coordinator, Science and Environmental Education, San Bernardino County Superintendent of Schools, 601 North E Street, San Bernardino, CA 92415, phone 909-386-2616

❖ San Diego County Office of Education [http://www.sdcoe.net/Pages/Home.aspx]
- Science Professional Development: http://www.sdcoe.net/lls/ccr/Pages/sciencepd.aspx
- Science Leadership and Professional Development Network

- NGSS Grade Level Academies
- NGSS Tools and Processes
- Elementary Science Academy

  Contact: John Spiegel, Science Coordinator, Curriculum and Instruction Unit, San Diego County Office of Education, john.spiegel@sdcoe.net, phone 858-292-3854

❖ San Joaquin County Office of Education [http://www.sjcoescience.org/]

- Professional Development for NGSS Awareness focusing on the CA-NGSS Science and Engineering Practices
- Conceptual Flow Mapping of the Core Ideas of CA-NGSS
- Modeling in Math and Science using Simulation and Computer Programming at 9-12 Grade
- Modeling at Primary Grades using Stop Motion Animation
- Shifting Practices: How lesson approach can determine
- Awareness to Transition Workshops: Planning for NGSS Cur
- Selecting a Middle School Model, Integrated vs. Discipline Specific
- Great Explorations in Math and Science (GEMS) Kit Training
- Starlab Training
- Flipping Instruction
- Scientific Notebooks: How different approaches can lead to new outcomes
- Modeling with CCSS-Math and NGSS

Contact: Kirk Brown, Director, Science and STEM Integration/Innovation, San Joaquin County Office of Education, Educational Services, 2707 Transworld Drive, Stockton, CA 95206, phone 209-468-4880

- San Luis Obispo County Office of Education [http://www.slocoe.org/]
  - Professional Development for NGSS Awareness focusing on the CA-NGSS Science and Engineering Practices
  - Conceptual Flow Mapping of the Core Ideas of CA-NGSS
  - Engineering is Elementary provider for K-8 grades

    Contact: Patricia Garrett, Director, Curriculum, Instruction, and Technology, San Luis Obispo County Office of Education, 3350 Education Drive, San Luis Obispo, CA 93405, phone 805-782-7271

- Sonoma County Office of Education [http://www.scoe.org/]
  - SCOE partners with the 40 districts and 182 schools in the county to provide support and services to all students. The Educational Support Services Department is committed to providing quality support and training for teachers, schools, and districts as they seek to serve all students and engage in authentic 21st Century instruction.
  - Current Resources
    - Professional development for NGSS awareness and site and district collaboration
    - Science webpage- information about local and statewide professional learning, summaries of NGSS information, blog about NGSS issues (www.scoe.org/science)
    - Teacher leaders in science education who can train others and model best practices
    - Teacher developed blog of NGSS lessons and classroom and teaching practices
    - Teacher-driven K-8 professional development in science

- Future Resources
    - STEM and NGSS Science Fair Model
    - NGSS and Make: Creative Integration
    - Fostering Science Literacy- Reading, Writing, and Evaluating
    - Science and Engineering Practices Overview and Integration
    - Teacher-driven transition to NGSS for 9-12
    - Facilitated course model forums, 6-12
    - Integrating Science Literacy with CCSS ELA- Text Bundling and Inter-textual Connections
    - Arguments from Evidence: The Convergence of CCSS Math and ELA and NGSS
    - Integrated Performance Tasks Based on Driving Questions
    - Integrating Math and Science in Project Based Learning

  Contact: Anna Van Dordrecht, SCOE Science Teacher-on-Loan, Sonoma County Office of Education

❖ Stanislaus County Office of Education [http://stancoe.org/]
- The Stanislaus County Office of Education, through effective leadership, coordinated services, staff development, and partnerships among family, school and community, will support public education in preparing diverse students to become productive citizens and life-long learners.
- Support for Science Education: (This link is no longer valid and has been removed.)
- Professional Development for NGSS Awareness focusing on the CA-NGSS Science and Engineering Practices
- Conceptual Flow Mapping of the Core Ideas of CA-NGSS

- STEAM Workshops to Integrate
- NGSS Awareness to Transition Workshops
- Grade Alike Workshops Link Science Educators
- Selecting a Middle School Model, Integrated vs. Discipline Specific
- EiE Trainings – Engineering is Elementary
- Project WET Training – Using Project WET to meet the needs of the Common Core and Next Generation Science Standards
- StarLab Training - (This link is no longer valid and has been removed.)
- Flipping Instruction in Science
- Google Applications for Education
- Scientific Notebooks/Interactive Notebook Workshops
- Modeling with CCSS-Math and CA-NGSS
- Grant Writing and Support
- Partnerships and Resources – (This link is no longer valid and has been removed.)

  Contact: Sean Timmons, STEM Consultant, Instructional Support Services, Stanislaus County Office of Education, phone 209-238-1336

- Tehama County Department of Education [http://www.tehamaschools.org/]
  - NGSS Task Force Meetings (Grades 6–12) - modeling of NGSS lessons and support in lesson development
  - Professional Development for NGSS Awareness focusing on the CA-NGSS Science and Engineering Practices
  - Selecting a Middle School Model, Integrated vs. Discipline Specific
  - Great Explorations in Math and Science (GEMS) Kits with personalized training as needed
  - Technology enhanced science and engineering lessons
  - Model lessons connecting CCSS-Math, CCSS-ELA and NGSS
  - Model lessons that incorporate the NGSS Science and Engineering practices
  - Summer STEM Camp for students

    Contact: Lorna Manuel, Director, Education Support Services, Tehama County Department of Education, 1135 Lincoln Street, Red Bluff, CA 96080, phone 530-528-7344

- Tulare County Office of Education [http://www.tcoe.org/]
  - Educational Resource Services is your "one-stop shop" for all instructional and creative needs. ERS offers programs and services to help teachers teach and students achieve.
  - Common Core: http://www.tcoe.org/ERS/CCSS.shtm
  - STEM Professional Development Opportunities: (This link is no longer valid and has been removed.)
  - Our workshops will evolve and are developed based on the needs of teachers and students.
    - Making Sense of It All: NGSS (Grades K–5, 6–8, 9–12)
    - Engineering is Elementary (EiE)

- From Common Core and the NGSS to Classroom Instruction
- Great Explorations in Math and Science (GEMS) Kit Training
- Trouts in the Classroom
- High Quality Questions Lead to High Quality Discussions
- Interactive Science Notebooks
- Project Wet

Contact: Jared Marr, Staff Development and Curriculum Specialist, STEM and CCR, Tulare Office of Education, 7000 Doe Avenue, Suite A, Visalia, CA 93291, phone 559-651-3047

Professional Associations and Stakeholder Organizations (in alphabetical order)

- Alliance for Climate Education (ACE) [http://www.acespace.org/]
  - Alliance for Climate Education (ACE) is the national leader in high school climate science education. We are an award-winning national nonprofit dedicated to educating America's high school students about the science behind climate change and inspiring them to do something about it -- while having fun along the way. ACE offers two core programs: the ACE Assembly and the Student Action Program. The ACE Assembly teaches climate science that puts teenagers at the center of the story. Our live in-school assemblies combine airtight science with pop-culture entertainment. The Student Action Program gives every student a chance to take action. For some, it's a small lifestyle change. For others, it's hands-on preparation for a lifetime of leadership.

  - The ACE Assembly addresses many of the middle and high school NGSS Disciplinary Core Ideas (DCIs) contained within the Performance Expectations. (See a list of DCIs addressed: https://acespace.org/our-work/#climate-education) ACE operates in the Los Angeles, Bay Area and Sacramento regions. Book an ACE Assembly at your school. (This link is no longer valid and has been removed.)

- Online Climate and Energy Lesson Plans (This link is no longer valid and has been removed.) offers the best high school resources for climate science and energy education. This list includes the ACE Ocean Acidification Animation, ACE Science Reports and links to resources from our partners at CLEAN (Climate Literacy and Energy Awareness Network) and NEED (National Energy Education Development Project).

  Contact: Rebecca Anderson, Director of Science and Education, ACE: Alliance for Climate Education, phone 530-214-9078

❖ Aquarium of the Pacific [http://www.aquariumofpacific.org/]

- The nonprofit Aquarium of the Pacific is a community gathering place where diverse cultures and the arts are celebrated and where important topics facing our planet are explored by scientists, policymakers, and stakeholders in search of sustainable solutions. The Aquarium is dedicated to conserving and building nature and nature's services by building the interactions between and among peoples. Home to more than 11,000 animals, Aquarium exhibits include the June Keyes Penguin Habitat, Ocean Science Center, Molina Animal Care Center, and the interactive Shark Lagoon and Lorikeet Forest exhibits. Beyond its animal exhibits, the Aquarium offers educational programs for people of all ages, from hands-on activities to lectures by leading scientists. Each year, the Aquarium serves about 160,000 students, teachers, and community members with educational programming.

- Aquarium Webcam Resource Kits and Webcams – These inquiry-based kits encourage students to make observations using the Aquarium's live streaming animal webcams, and were designed specifically to assist teachers in NGSS implementation.
  Lesson plans: http://www.aquariumofpacific.org/teachers/resources/lesson_plans
  Webcams - http://www.aquariumofpacific.org/exhibits/webcams/

- Southern California Whale Research Project App: Connecting People, Science, and Whales – This data focused application allows students to manipulate and track historical data on whale sightings off the coast of Southern California.
  (This link is no longer valid and has been removed.)

- Story Mapping and GIS (Geographic Information Systems) – Story maps have been created to help students explore data and study the natural world around them through spatial visualization. The Aquarium also provides students/teachers tutorials and samples that guide them on building individualized story maps.
  http://aop.maps.arcgis.com/home/

- Interactive Video Conferencing programs – These standards based educator-led programs are taught live to classrooms nationally and internationally through videoconferencing technology. http://www.aquariumofpacific.org/education/yourfieldtrip/outreach/videoconf

- Onsite educational programs – The Aquarium offers over 40 inquiry and standards based educational programs for preschool to college age students focused on marine science and climate change issues. http://www.aquariumofpacific.org/education/yourfieldtrip/schoolprograms

- Guest lectures - The Aquarium's guest scientist lecture series provide teachers the opportunity to connect with scientists to learn about current science. Lectures are broadcasted live to the web. http://www.aquariumofpacific.org/events/category/live_web_stream

- Teacher workshops – The Education department offers a variety of teacher workshops through the year including workshops specifically focused on data-driven classroom programming, robotic exploration of our oceans and planet, and NGSS implementation. In addition, the Education department leads a grant-funded week long intensive introduction to the Aquarium, Southern California's diverse ecosystems, and current research being conducted by local scientist. http://www.aquariumofpacific.org/teachers

❖ Birch Aquarium at Scripps Institution of Oceanography, University of California San Diego [http://aquarium.ucsd.edu/]

- Birch Aquarium is the non-profit public outreach center for Scripps Institution of Oceanography at the University of California San Diego in La Jolla, CA. With a mission to provide ocean science education, make Scripps Oceanography cutting-edge research accessible to the public, and promote ocean conservation, Birch Aquarium presents exhibits and programs that foster critical thinking, provide insights into and opportunities to experience the process and practice of science, and highlight the relevance of science to people's daily lives. School programs for grades pre-K–12 explore the science of our oceans and earth and are offered in the Aquarium's classrooms, on the beach, and at area schools. Financial assistance is available for Title 1/underserved schools. Educators can visit the Aquarium for free in advance of their program.

- NGSS-aligned programs include Discovery Labs at the Aquarium, Beach Science field classes, and Aquarium Express outreach to schools

- Inquiry-based guide available online to support self-guided visits

- Fall Educator Open House to acquaint educators with full range of STEM education programs and resources available

- Exploring OceanSTEM Careers Event for middle and high school students and their parents

- Teacher professional development focused on implementation of NGSS

- Graduate student involvement in select programs provide diverse role models for students

- Array of STEM-based family programs

  Contact: Charina Cain, Education Manager, Birch Aquarium at Scripps, phone 858-822-5331

❖ California Academy of Sciences [http://www.calacademy.org/]

- Founded in 1853, the Academy's mission is to explore, explain, and sustain life. To support this mission, the Academy conducts local and global scientific research in the world's biodiversity hotspots to document life and promote conservation policies and practices; operates a public facility that houses an aquarium, rainforest, planetarium, and natural history museum and that incorporates environmentally pioneering green design; and provides educational programs for participants of all ages, within and outside our walls, designed to promote scientific literacy and environmental sustainability. We strive to make science and sustainability education exciting, engaging, and relevant to people of broad backgrounds and ages. From July 2013 to June 2014, school field trips brought almost 140,000 excited students, teachers and chaperones to the Academy; over 1,000 teachers participated in our professional development programs; hundreds of thousands of educators, students and interested members of the general public used our online

educational resources; and hundreds of teens benefitted from our immersive science experiences offered outside of the formal classroom.

- NGSS professional development workshops for teachers, schools and districts, including beginner's level to build a basic understanding of the NGSS, and intermediate level to explore each dimension in-depth. Advanced level training and support will be available by 2016. Information about all our PD offerings can be found at http://www.calacademy.org/educators/professional-development.

- Revised and new NGSS-aligned lesson plans and other resources will be posted to our Web site as they are developed: http://www.calacademy.org/educators/teaching-resources.

  Contact: Meg Burke, Director of Teacher and Youth Education, California Academy of Sciences, 55 Music Concourse Drive, Golden Gate Park, San Francisco, CA 94118, phone 415-379-5101

❖ California Science Center [http://www.californiasciencecenter.org/]

- The California Science Center is open to the public seven days a week, 362 days per year, with free general admission to its permanent exhibit galleries. The facility spans more than 400,000 sq. feet and includes four major exhibit areas. *World of Life* [http://www.californiasciencecenter.org/Exhibits/WorldOfLife/WorldOfLife.php] probes the commonalities of the living world, from the single-celled bacterium to the 100-trillion-celled human being; *Creative World* [http://www.californiasciencecenter.org/Exhibits/CreativeWorld/CreativeWorld.php] examines the ways people employ technology to meet their needs for transportation, communication and structures; and *Ecosystems* [http://www.californiasciencecenter.org/Exhibits/WorldOfEcology/WorldOfEcology.php] features an unprecedented blend of nearly 400 species of live plants and animals, and hands-on exhibits in 11 immersive environments. *Ecosystems* highlights include an 188,000 gallon kelp tank populated with live kelp, fish, and other marine life; a desert flash flood; and a special gallery dedicated to the urban ecology of Los Angeles. Additionally, *World of Life*, *Creative World*, and *Ecosystems* each have a Discovery Room intended for children 7 years of age and younger.

  On October 30, 2012, Space Shuttle Endeavour [http://www.californiasciencecenter.org/Exhibits/AirAndSpace/endeavour/endeavour.php] opened to the public in the Science Center's newly built Samuel Oschin Pavilion. In the Pavilion, guests are able to see

Endeavour up close and discover some of the science behind this amazing space vehicle. The Samuel Oschin Pavilion also features SPACEHAB, a workshop for astronauts while in space, and a space shuttle main engine (SSME) which helped push the shuttle into orbit. Before entering the Pavilion, guests enjoy an introductory experience, *Endeavour: The California Story*, [http://www.californiasciencecenter.org/Exhibits/AirAndSpace/endeavour/endeavour.php] which celebrates Endeavour's many scientific achievements and its strong connection to California, where all the orbiters were built. The California Story includes the Rocketdyne Operations Support Center (ROSC), which monitored the first 8 and a half minutes of every shuttle launch, Endeavour's space potty and galley, and the tires from STS-134, Endeavour's final mission. In addition to the orbiter, the Science Center's unique collection of *Air and Space Exhibits* [http://www.californiasciencecenter.org/Exhibits/AirAndSpace/AirAndSpace.php] explores the design of aircraft, spacecraft, and space probes for specific tasks by applying the principles of air, space, and flight.

The Science Center also hosts international touring exhibits and has an educationally focused *IMAX Theater* [http://www.californiasciencecenter.org/Imax/Features/Features.php] with the capacity to create images of exceptional clarity and impact through the use of the largest film frame in the motion picture industry. The 7-story screen brings to life worlds as small as an atom and as vast as the universe.

- Big Lab Field Trips – Make your field trip a memorable learning experience with a Big Lab program! Available for Grades K–8, all programs are hands-on, complement Next Generation Science Standards, and are facilitated by a Science Center educator. http://www.californiasciencecenter.org/Education/GroupPrograms/BigLab/BigLab.php

- Science on Tour - Bring the California Science Center to your school by scheduling a performance of one of our original educational programs, created to complement Next Generation Science Standards. Make sure to check out our newest program –Astro Adventures! http://www.californiasciencecenter.org/Education/GroupPrograms/ScienceTheater/ScienceTheater.php

- Activity Stations – Look out for Science Center staff at Activity Stations throughout the exhibit halls demonstrating exciting, fun-filled science activities! Each station highlights a science topic inspired by one of our exhibits and meets Next Generation Science Standards.

- Discovery Rooms – Within the three main exhibit halls of the Science Center you can find uniquely innovative rooms designed to foster and support young children's first science explorations. These learning

environments provide opportunities for interactive, inquiry-based investigations that prepare young visitors for later science experiences.
http://www.californiasciencecenter.org/Education/FamilyPrograms/DiscoveryRooms/DiscoveryRooms.php

- Homeschool Days – Join us on select days throughout the school year as homeschool students come together to explore a variety of science concepts! Each day will feature age-appropriate activities held in our educational classrooms and the Big Lab [http://www.californiasciencecenter.org/Education/AboutUs/Annenberg/BigLab/BigLab.php]. See link for dates, topics, and availability.
http://www.californiasciencecenter.org/Education/GroupPrograms/HomeSchool/HomeSchool.php

- The California Science Center is well-positioned to address the need for more effective STEM and Next Generation Science Standards instruction by designing and providing effective hands-on professional development programs and resources. The California Science Center has provided standards-based STEM professional development and curriculum for years to teachers, parents, community youth educators, schools, and school districts.

  Administrator, parent, and teacher programs have been presented in a variety of forms: one-day workshops, multi-day, week-long institutes and multi-year contracts with school districts. We host participants from schools throughout Southern California, providing them with materials and strategies to teach STEM using hands-on, inquiry-based pedagogy, aligned with California State Science Content Standards and now Next Generation Science Standards and Common Core.

  The professional development and curriculum is rooted in the mission of the California Science Center's K – 5 Charter Science School that the Los Angeles Unified School District has designated as a model school for Common Core State Standards. The school also is a model school for STEM and Next Generation Science Standards instruction. It is a dual-language, neighborhood school where students learn through active participation in an enriched curriculum that utilizes STEM and standards as a foundation to teach all subjects. The school integrates both formal and informal learning, and builds the interconnection between classroom experiences, Science Center exhibits and resources, the students' views of the world, and life-long learning.
http://www.californiasciencecenter.org/Education/ProfessionalDevelopment/ProfessionalDevelopment.php

Contact: Gretchen Bazela, Director of Public and Community Programs, California Science Center Foundation, 700 Exposition Park Drive, Los Angeles, CA 90037, phone 213-744-2041

- California Science Project/University of California Office of the President [http://csmp.ucop.edu/csp]
  - The California Science Project is part of the nine California Subject Matter Projects, a statewide network of discipline-specific projects that provide rigorous professional development to K–12 teachers. The California State Project programs are designed and implemented by K–12 and university educators, scientists and engineers to enhance learning for all students.
  - Technical assistance for the integrated implementation of NGSS and Common Core
  - Leadership development for teachers and administrators
  - Emphasis of long-term focus on teacher professional learning and teacher-driven instructional shifts

    Contact: Maria Chiara Simani, Ph.D., Executive Director, California Science Project, Department of Physics and Astronomy, University of California Riverside, 900 University Avenue, Riverside, CA 92521, phone 951-827-3111

- California Science Teachers Association (CSTA) [http://www.cascience.org/]
  - California Science Teachers Association (CSTA) is dedicated to promoting high quality science education in California. Comprised of science educators from the PK-university and informal settings, CSTA supports science educators through professional development, accurate and timely information, publications, and advocacy. CSTA works to ensure that the interests of science educators are represented at the state level, demonstrates leadership in the state by organizing and participating in statewide reform initiatives, and promotes leadership opportunities for members who wish to participate at the state level.
  - Current and accurate information related to NGSS in California [http://www.cascience.org/csta/ngss.asp].
  - Science Education Conferences to support teachers as they implement NGSS [http://conference.cascience.org/]
  - Monthly California Classroom Science publication with articles featuring NGSS implementation, integration and support https://classroomscience.org/]

- Participation in developing and delivering statewide NGSS workshops

- Collaboration with educational leadership, science education and STEM education entities throughout the state

  Contact: Laura Henriques, CSTA, 950 Glen Drive, Suite 150, Folsom, CA 95630, phone 916-979-7004

❖ CalRecycle's Office of Education and the Environment [http://www.californiaeei.org/]

- The Office of Education and the Environment (OEE) oversees implementation of the California Education and the Environment Initiative (EEI), with the goal of increasing environmental literacy in K–12 students through environment- and academic standards-based education.

- The EEI is based on 5 Environmental Principles and 14 supporting Concepts (EP&Cs) that focus on the interactions and interdependence of human societies and natural systems. A 2003 law requires that these EP&Cs be incorporated into future California textbook adoptions, which include those relating to NGSS. http://www.californiaeei.org/abouteei/whatistaught/epc/

- Forty (40) science-based EEI Curriculum units [http://www.californiaeei.org/curriculum/] and associated NGSS correlation documents [http://www.californiaeei.org/curriculum/correlations/nextgenscience/] that are free to California educators. The EEI Curriculum is a great tool for transitioning to NGSS and also supports the California Common Core Standards [http://www.californiaeei.org/curriculum/correlations/commoncore/].

- Teacher trainings, including in-person and webinars, focused on the EEI Curriculum. [http://www.californiaeei.org/training/]

  Contact: Bryan Ehlers, Director, CalRecycle, Office of Education and the Environment, 1001 I Street, Sacramento, CA 95812, phone 916-341-6769

❖ Discovery Cube Orange County / Discovery Cube Los Angeles [http://www.discoverycube.org/]

- Discovery Cube Orange County, located in Santa Ana, CA and Discovery Cube Los Angeles, located in the Hansen Dam Recreation Center in the San Fernando Valley, CA, are nonprofit science centers with a shared mission to inspire and educate young minds through engaging science-based programs and exhibits to create a meaningful impact on the communities we serve. Annually, Discovery Cube teaches educators

and students from 112 school districts in six southern California counties in grade-specific, STEM-based, onsite and offsite programs. In 2013, the Science Center received the IMLS National Medal of Service, the highest honor awarded to science centers, museums, and libraries in America.

- NGSS-focused professional development programs for teachers
- STEM-based “Do It Yourself” kits of materials for in-school and out-of-school time programs
- Train-the-trainer professional learning programs for afterschool providers
- Interactive, grade-specific field trips (preschool – 12th grade levels) using large-scale, hands-on exhibits, science demonstrations, and written guides
- 4th and 5th grade, interactive exhibits specifically designed for teaching NGSS
- In-school and afterschool STEM-based programs, including workshop-style programs, assemblies, and a portable planetarium
- Community-focused programs for the entire family, including participatory and competitive events, such as an Annual Fall Pumpkin Launch, Winter “Science of Gingerbread” Competition, and Annual Spring Rocket Launch
- Teacher Education Network (TEN) online resource and incentive program
- Summer camps for age-spans, such as 5–6 year old and 7–10 year old camps
- Early Learners and “Futuros Radiantes” programs that include parent only workshops to teach parents of preschoolers (including Spanish-speaking parents) how to help their children excel in science, math and reading

Contact: Janet Yamaguchi, Vice President, Education, Discovery Cube (formerly Discovery Science Center), Santa Ana, CA, phone 714-913-5005

- K–12 Alliance/WestEd
  - K-12 Alliance: http://www.k12alliance.org/
  - WestEd: http://www.wested.org/

  - A full service professional learning organization dedicated to improving science and math education by enhancing teacher content and pedagogical knowledge, building district and school leadership capacity, and creating science-centered schools. Our work is often done in collaboration with other partners

  - Customized professional learning for NGSS awareness, transition and implementation stages

  - Professional learning experiences for NGSS in the following areas:

    - Curriculum

    - Instruction

    - Assessment

    - School Culture

    - Community Support

    - Leadership

    - Administrator and Teacher Learning

  Contact: Kathy DiRanna, K–12 Alliance/WestEd, 4665 Lampson Avenue, Los Alamitos, CA 90720, phone 714-894-1445

- NatureBridge
  - NatureBridge fosters environmental literacy to sustain our planet. Through hands-on environmental science programs in nature's classroom, we bring science to life for more than 30,000 children and teens each year. With our vision for a more sustainable planet, we advocate for effective environmental education in our schools to create pathways to environmental literacy for all young people.

- Our multi-day, residential environmental science programs support state and national standards. Teachers select from a variety of areas of study that are unique to each national park location and are designed to connect to classroom curricula. Embedded in our teaching is a strong emphasis of the NGSS Practices.

- In some of our locations, we offer teacher professional development workshops, where teachers receive training from NatureBridge staff and local experts, develop comfort teaching outdoors, connect with their peers, and walk away with standards-based lesson plans.

- More information about our programs can be found at www.naturebridge.org.

- Want to help kids learn more about their environmental impact? Check out www.garbology.org. This online learning tool offers lesson plans and an interactive activity that helps students learn about the importance of waste reduction.

❖ PBS LearningMedia California [http://ca.pbslearningmedia.org/]

- PBS LearningMedia California provides more than 7,000 science resources for educators looking to teach science through media and new media. Educators can search these growing collections by subject, grade and standard. This digital library includes trusted public media content including NOVA and PBS Digital Studios as well as student access through the newly unveiled student portal and a wealth of teacher productivity tools.

- Student Portal: http://www.pbslearningmedia.org/student/

- Teacher Productivity Tools: http://blogs.kqed.org/education/2014/10/01/pbsstudents-org-teacher-productivity-tools-join-the-pbs-family/KQED Education produces free science education resources for engaging students in science education through the creation of free e-books and accompanying iTunes U courses produced in partnership with Bay Area organizations, KQED Do Now Science, a project designed to engages students in discussion around current real-world science issues and QUEST, a multi-platform series focused on diverse science and engineering stories.

- KQED e-books: http://blogs.kqed.org/education/e-books/

- KQED Do Now Science: https://www.kqed.org/science/

- QUEST: http://science.kqed.org/quest/

  Contact: Jamedra Brown Fleischman, Social Media and Outreach Specialist, Education, PBS LearningMedia California, 2601 Mariposa Street, San Francisco, CA 94110, phone 415-553-3329

❖ Smarty Pants [http://www.teachsmartypants.com/]

- Smarty Pants is a non-profit organization that creates interactive media and curricula that teaches science through environmental contexts. Our curricula is designed to align with the Next Generation Science Standards. Our mission is to spark students' interest in science and inspire environmental stewardship.

- Smarty Pants' primary resource is our library of interactive media lessons. Smarty Pants lesson plans save teachers time by providing them with engaging, interactive, and comprehensive materials that can be easily integrated into their daily lessons. We clearly outline which Next Generation Science Standards are covered. Our lesson plans include everything a teacher needs to teach science topics in the most effective and impactful way:

  - Introductory questions to pique student interest

  - Hands-on experiments to engage students

  - An interactive, short, live-action webisode

  - Supplementary 'shorts' to highlight current research related to the specified topic

  - Follow up and/or extension activities

  Contact: Julie Dragos, Education Director, Smarty Pants, 1015 Laguna Street #14, Santa Barbara, CA 93101, phone. 951-317-6532

- MESA [http://mesa.ucop.edu/]
  - MESA has served as a national model for academically preparing disadvantaged students to excel in science, technology, engineering, and math (STEM) fields, go to college and graduate. MESA provides academic support to 20,000 pre-college students across the state. MESA also operates programs at community colleges and universities.

  - MESA is an award-winning academic enrichment program that provides a unique combination of enrichment activities, tutoring, mentoring, project-based learning, course counseling and industry involvement. MESA functions through a partnership with all public and private segments of education in California and serves students through centers housed on campuses.

  - Established in 1970, MESA is a nationally-recognized program with a model that works. Seventy-six percent of MESA high school graduates statewide went directly to college after graduation compared to 41 percent of all California graduates. Fifty-three percent of MESA high school graduates continue their education as math, science or engineering majors.

    - Through MESA local educators and students receive:

    - MESA Day competitions: hands-on science and engineering contests, using NGSS-aligned curriculum

      - Professional development through the Virtual MESA Academy for Science and Mathematics Educators (MASME), which provides fresh ways for MESA teachers to connect math and science theory to project-based learning and hands-on practices (includes Common Core and NGSS workshops) http://mesa.ucop.edu/stem-teachers-expand-expertise-virtually-72214/

    - Regional professional development with intensive hands-on training for teaching MESA Day projects

    - MESA periods during the school day to implement NGSS-aligned hands-on learning

    - Mentor opportunities of new MESA teachers by veteran MESA teachers on MESA Day best practices

- Continual professional development through webinars
- Online resources for MESA teachers including updated curriculum manuals and MESA Day guides
- Collaboration with industry to create NGSS-aligned curriculum

Contact: Danielle McNamara, Assistant Director, Strategic Communications, MESA Mathematics, Engineering, Science Achievement, University of California, Office of the President, phone 510-987-0230, fax 510-763-4704, 300 Lakeside Drive, Oakland CA 94612

- Slide Ranch [http://www.slideranch.org/]
  - Slide Ranch has been planting kids in nature since 1970. We connect Bay Area children to sustainable farming and healthy eating, and inspire environmental stewardship through programs and camps on our 134 acres of coast lands in Marin, California. Slide Ranch's educational curriculum is based on hands-on activities linked to Next Generation Science Standards. During day and overnight field trips to our farm-based environmental education center, program participants connect with the natural environment (milking a goat, gardening and cooking, exploring coastal trails and tide pools) where science concepts come to life.
  - Teach wide range of place-based activities linked to NGSS connected to organic agriculture and farm animals, as well as native plants and animals in 134 acres of preserved coastal scrub habitat, including ocean tide pools.
  - Share online curriculum including pre and post-visit resources and NGSS-linked activities for use by classroom teachers and the general public.
  - Provide the grounded, physical context to investigate and apply NGSS Life Science, Physical Science, Earth Science and Engineering Design concepts.
  - Engage NGSS through hands-on exploration of *crosscutting concepts*: Patterns, similarity, and diversity; Cause and effect; Scale, proportion and quantity; Systems and system models; Energy and matter; Structure and function; Stability and change.
  - Align with NGSS *core ideas*, particularly, prioritizing study of ocean science and climate change, and share a common aim of promoting environmental sustainability: valuing awareness of our use of natural resources and humans' impact on the environment.

- Apply NGSS *practices* and encourage participants to engage with the natural world like scientists-in-training: making observations, asking questions, gathering information, conducting investigations, defining problems and designing solutions.

- Slide Ranch Curriculum: Themes, Activities and NGSS: https://dow9ovycsk6w7.cloudfront.net/media_items/12565-Curriculum_Activities_Themes__NGSS.pdf?1412943645

  Contact: Julie Hartman, *Program Manager,* Slide Ranch, 2025 Shoreline Highway, Muir Beach, CA 94965, phone 415-381-6155

❖ San Diego Science Alliance [https://www.stemschool.com/school/san-diego-science-alliance]

- As San Diego's leading force for STEM advancement, the San Diego Science Alliance puts our expertise and resources into action to ignite passion and strengthen the education-industry pipeline. For over two decades our programs and services have connected educators, industry, research and university partners to inspire, engage and the plant seeds of innovation and creativity in the region's 500,000 K-12 students. Each year the San Diego Science Alliance reaches: 30,000 K-12 students, 3500 teachers, and 300 industry, research and university partners. We assist all of San Diego County and serve as the lead San Diego regional alliance partner of the California STEM Learning Network, our San Diego STEM Collaboratory.

- Links to industry connections, STEM Quality Criteria Rubric, online eNews for up-to-date professional development and community partner opportunities with which to engage in NGSS practices.

  Contact: Ellen Peneski, San Diego Science Alliance/San Diego STEM Collaboratory, Executive Director, phone 619-487-0930, cell 619-325-9119