Region 10:
Riverside | Inyo
Mono | San Bernardino

Opportunity for Successful Science Implementation in a Post-Pandemic Climate

GUIDANCE PLANNING FOR HIGH QUALITY SCIENCE INSTRUCTION TK–12

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Why This Matters to All of Us

Science education is foundational. The knowledge and skills taught in Next Generation Science Standards (NGSS) science classrooms are vital for student success, not only as students matriculate through school, but also in the 21st century economy. With a laser focus on English language arts and mathematics instruction, there is a clear and present danger that science instruction is being systematically minimized across the state. Students are struggling from the lack of support of high-quality science instruction. This current situation must be addressed directly. After eleven years of NGSS adoption there is still not enough evidence of significant change in instruction.

High-quality NGSS instruction encompasses rigorous phenomena-based inquiry that inspires critical thinking and sense-making in the discipline of science, through communication within a scientific community. The ability to collaborate and apply creativity through problem-solving fosters applications in engineering, and can be integrated with project-based learning approaches that weave science and other subjects together.

These skills build language proficiency and data literacy, utilizing relevant and engaging content for all learners. While science education equips students with sought-after technical skills and prepares them for high-demand careers in science research, engineering, and computer science fields, its purpose in K-12 schools is more fundamental. It is about providing every student with the opportunities and tools to become scientifically literate citizens, able to navigate daily life, work, civic engagement, and community in an increasingly technology-driven world.

Pre-pandemic, districts targeted system-wide changes that supported these fundamental instructional shifts; distance learning has magnified the need to focus on strong instruction that supports every student. This requires deliberate, measurable goals and equitable actions that explicitly utilize the terms **"Science, NGSS, Environmental Literacy, STEM /STEAM"** in local plans, ensuring that districts prioritize science instruction for all students.

This document is intended to support and encourage school districts to reflect upon their current plan, evaluate the inclusion of science instruction, and prioritize science when drafting future funding allocations. It is organized into three sections: *(1) Measuring Science Student Achievement, (2) Goals for Science, and (3) Funding to Support Science Equity for All (Figure 1).*

Figure 1: Measuring Science Student Achievement Using Investments and Goals

Measuring Science Student Achievement

WHAT IS THE ISSUE?

While funding categories were designed to encompass the implementation of all California content standards, including science, there has been a historic practice of focusing solely on English language arts and mathematics in spite of evidence that suggests this is not what is best for students. It may be that this misconception exists because of the requirement to link expenditures directly with student data outcomes. The California Science Test (CAST) data will appear on the California Assessment Dashboard. The California Department of Education (CDE) publicly releases CAST summary results for the state, county, district, and school levels by student groups.

Since the CAST and the California Alternate Assessment (CAA) for science are still in infancy, there are clear limitations in the science community's ability to provide quantitative data that defines gaps in achievement within supplemental concentration groups. This has led to a fiscal phenomena which dramatically limits science funding and impacts all aspects of providing every student a well rounded academic program. Lack of deliberately naming support or services related to **Science, NGSS, Environmental Literacy, STEM, or STEAM** inhibits equitable access of this vital content to supplemental concentration groups (English learners, Foster Youth, and Socio-Economically Disadvantaged students).

Measuring Science Student Achievement

TAKE ACTION:

Focus on system-wide actions to measure **science learning gaps** that has affected students TK–12 and provide this data to your district writing team for review with educational partners.

Science Student Achievement Metrics to Consider:

- Survey elementary school sites to identify the amount of weekly science instructional minutes that were spent making sense of phenomena and compare this year to previous years' minutes.
- Survey secondary teachers about content gaps utilizing the pacing guide/ curriculum maps/disciplinary core ideas and compare this year with previous years.
- Point to the pause created by not rolling out new High-Quality Science Curricula (textbook adoptions or other inquiry based science resources).
- Survey all science teachers to identify how many professional learning hours were devoted to science and compare this year with previous years.
- Survey all science teachers to identify substantial changes in student performance on classroom-based assessments.
- Use local common formative assessment measures (benchmarks) to identify gaps in learning and compare this year to previous years.
- Use initial CAST data to identify gaps that exist in supplemental concentration and historically underserved groups.
- Compare science and attendance data. Is there a correlation between when STEM or science activities are being conducted and positive attendance outcomes?
- Use science and engineering fair participation data. Compare this year to previous years; was there a drop in participation?
- Compare ELA and Math CAASPP data between STEM schools and non-STEM schools.
- Compare D/F rates in science courses. Compare this year with previous years.
- Survey your parents/families. What are their perceptions of student achievement in science?

District Science Learning Goals/Actions

WHAT IS THE ISSUE?

Districts have autonomy to create local goals and annual action items with the aim of improving the instructional outcomes for all students. The primary objective is to list services above and beyond the district's base program that will support student achievement for supplemental concentration student groups. While goals tend to be multi-year targets, action items are the budgeted strategies (e.g., instructional materials, professional development opportunities, extra-curricular offerings, etc.) that serve as the guide to accomplishing the goals. Each action item is apportioned in a specific budget and its effectiveness is evaluated annually.

The assertion of this document is that **Science, NGSS, Environmental Literacy, STEM, and STEAM** are not specifically mentioned in action items throughout many districts. This lack of acknowledgement as a core content area leads to an unintentional abandonment of science support. Science advocacy begins through action items as they directly impact a district's ability to fund specific instructional supports and services. Supplemental concentration groups are the most at risk of losing all science instruction if funding support is not explicitly allocated. Strategically drafted action items are vital to offer equitable student access to high quality science instruction and increase science student achievement.

District Science Learning Goals/Actions

TAKE ACTION:

Write TK–12 actions tied to the instructional goals that will focus on increasing science student achievement.

Reflective Questions About Goals/Actions to Consider:

- Does your plan allocate resources to support CA NGSS-aligned science education for all students?
- Are there any actions that need to be deleted or revised from the current plan to provide space for new innovations?
- Do current or proposed resource allocation advance equity in science for the EL students, Foster Youth, and economically disadvantaged students?
- Do schools have access to a science specialist/TOSA who has training in NGSS and phenomena-based instruction?
- Do science TOSAs have adequate funding and ongoing support for their own professional learning and growth to prepare them to provide consistent, ongoing professional development for all teachers?
- Do science TOSAs provide professional learning and classroom support for teachers around phenomena-based instruction and current NGSS shifts?
- Has curriculum been selected and purchased to support CA NGSS implementation? If not, what criteria will the district use to adopt instructional materials?
- Has the pandemic impacted NGSS-designed curriculum implementation? What steps could be taken to mitigate learning gaps over the year's cycle to launch, relaunch, or fully implement NGSS-designed curriculum?
- Do EL/special education/historically underserved students in elementary, middle, and high schools in the district have the same access to science instruction (coursework and time) and science specialists as other students, regardless of the school they attend?
- Are EL/special education/historically underserved students enrolled in high school science courses that are A-G approved?
- Are EL/special education/historically underserved supports provided so that students are supported to excel in college preparatory science courses?
- To what extent do the college prep/A-G science courses include the CA NGSS standards, which include three dimensions: core ideas, scientific and engineering practices, and crosscutting concepts?

Funding to Support Science Equity for All

WHAT IS THE ISSUE?

Districts that neglect to provide adequate funding for high quality science instruction are failing to prepare their students with the foundational skills and knowledge to contribute to the 21st century economy. This directly affects all students' science success, but most dramatically affects historically underserved, supplemental concentration, and "vulnerable at-risk" student populations. The ability to provide support services to science educators and students in our respective communities is directly connected to the investments made in the LCAP that go "above the core," and, as such, provide scaffolds for systematic equitable practices.

In many cases, the lack of explicit mention of science in the district plans disallows for schools to fund basic access to science courses. Some examples of inequitable science funding may include: (1) not having a designated science instructional support provider, (2) not having adequate funding for laboratory instructional supplies, (3) not having funding for upgraded technical equipment and machinery, and (4) not having funding that supports professional development in inclusive practices and culturally responsive teaching for lab-based classrooms. Culturally responsive teaching in science depends on hands-on learning opportunities, however, if the funding disallows for this practice then it disproportionately affects students of color and students receiving special education services. District equity goals should include access to advanced science courses for all students as well as services and support for inclusive practices in all science classrooms.

Funding to Support Science Equity for All

TAKE ACTION:

Write TK–12 actions tied to district equity goals that will focus on increasing science student achievement.

Reflective Questions to Consider:

- What "Conditions for Learning" support science opportunities for all students?
- Have you allocated sufficient funding annually for phenomena-based instructional materials such as laboratory materials and resources?
- What "Pupil Performance Outcomes" will be used as evidence of equitable access to science instruction?
- How do your supplemental concentration groups perform on science assessments? (Identify data that describes science achievement gaps for historically underserved groups and the actions that will be needed to close the gaps.)
- How has the district defined "equitable" science "engagement" for your student community?
- How are students and families, particularly those of historically underserved students, informed about the requirements for college preparatory science coursework and their students' progress toward D completion (A-G designation) versus graduation requirements?
- How much professional learning time during the contracted day are teachers and administrators provided to focus on: (1) Local and relevant phenomena-based instruction, (2) well-balanced, hands-on, and digital learning opportunities, (3) how to support inclusive NGSS practices, and (4) how to utilize culturally responsive teaching to better prepare all students for the CAST and post-secondary STEM opportunities?
- Have you allocated funding for a science specialist to support teachers with equitable science instruction?
- How does your district welcome families to learn about science and STEM opportunities?
- Does the district allocate funding to support culturally relevant science instruction in students' home languages?

Further Information and Reading

Reference/Source	Link
American Educational Research Journal	https://bit.ly/2NKbY3n
American Educational Research Journal	Impact of PD and Coaching
California Department of Education	California Science Test—Key Messages
California Environmental Literacy Initiative, County Office of Education Working Group (Dr. Amy Frame)	CAELI Webinar 3: Video Recording CAELI Webinar 3: Slides CAELI Webinar 3
Education Development Center	Start Young, Start Now: Key Actions to Improve Scientific Literacy
iD Tech	STEM Education Stats
NGSS	"All Standards, All Students"
Research Gate	Effect of Coaching Meta Analysis (need for TOSAs)
Research Gate	Importance of Ongoing Coaching
Sage Journals	Align EL Standards with Content Standards (Okhee Lee)
Sage Journals	English Learners and STEM: Opportunities (Okhee Lee)
Sciencenews	Science is Helping Kids Become Math Masters
The Lawrence Hall of Science, UCR Berkley	Science Education and Local Control | POLICY BRIEF | May 2015 LCAP Primer for Science and Environmental Literacy Advocates Local Control Accountability Plan (LCAP) Toolkit Talking Points FAQs Strengthening Science Education Science Guiding Question for Stakeholders Science Guiding Questions for District Leaders LCAP Content Science
The Physics Teacher	Post-pandemic Science and Education
UC Davis	STEM Jobs and California
WestEd	The Synergy of Science and English Language Arts: Means and Mutual Benefits of Integration

A SPECIAL THANK YOU TO:

A special thank you to our *District Science Leader's Community of Practice* (DSL-CoP). This document was presented to the DSL-CoP on February 3, 2021. The members in this group were able to read the document and provide feedback. This group includes science coordinators, directors, TOSAs, teachers, and other science leaders in Region 10. Region 10 is the geographic area in California that includes Inyo, Mono, Riverside and San Bernardino Counties.

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