CAL-MSCS Science Steering Team

*From Belief to Action:
A Framework Matrix to Guide the Design and
Implementation of Equity-Driven Professional
Learning Experiences and the Re-envisioning of
Professional Learning Systems*

Background Information

In October 2021, a group of statewide science leaders convened a coalition of educators and thought partners to identify priorities for equitable science education in California. In particular, the coalition discussed features of professional learning that disrupt harmful instructional practices for students often marginalized from science learning. Leveraging the themes from the National Academies report *Call to Action for Science Education*, the coalition co-authored the *Blueprint for Action for Equitable K-12 Science Education in California: Initial Steps for Coordinated, Systemic Reform*. The California Blueprint emphasizes the importance of: 1) ongoing statewide investments in science professional learning; 2) capacity building for local science leadership teams; and 3) advocacy for state funding dedicated for science teaching and learning.

Throughout the fall and winter of 2021, the coalition continued collaborating to realize the *California Blueprint's* recommendations, and helped draft language that resulted in Assembly Bill 185, Chapter 571, Statutes of 2022, Section 53 of the Education Omnibus Budget Trailer Bill for the 2022–23 CA State Budget. The Bill appropriated $85 million for educator professional learning and increased family engagement in mathematics, science, and computer science. In June 2023, the CA Department of Education granted $50 million of this provision to the San Joaquin County Office of Education to launch the CAL-MSCS Partnership to support statewide initiatives that strengthen professional learning for educators in grades 4-12.

CAL-MSCS Science Steering Team's Beliefs and Commitments

When the CAL-MSCS funds were awarded, several core leaders from the above science leadership coalition joined the CAL-MSCS Science Steering Team (SST) to lead the Partnership's science professional learning efforts. To anchor their support efforts in a shared framework for science educator learning, the SST worked throughout 2023 to distill the qualities of professional learning called for in the *California Blueprint* into specific beliefs, practices, and actions that ensure equity in science professional learning experiences and systems. They engaged in the following reflective questions:

- How will we ensure equity in science professional learning experiences?
- How will we influence professional learning systems towards equity?
- How will we employ a critical lens and expand our professional learning practices in more equitable ways?

Their answers define a key set of beliefs and commitments towards equitable science teaching and learning (see Table 1) that the SST consider fundamental to their work. Throughout the spring and summer of 2024, the SST made explicit how these beliefs and commitments should look, sound, and feel like in practice, resulting in a guiding framework for the design and delivery of equity-driven professional learning. The SST will base all science support and programming provided through CAL-MSCS upon this framework, operating from the theory of action that if science educators and their partners have access to professional learning systems and experiences that ensure equity, the students they serve will excel in science.

Table 1: SST Beliefs + Commitments

1. We believe **all students** are capable of excelling in science. So, we commit to designing professional learning experiences and systems of professional learning with each student's success in mind.

2. We believe **all educators** are capable of fully serving students. So, we commit to designing with each educator's success in mind.

3. We believe the **best professional learning** shifts educators' mindsets and practice and supports them so that their students thrive. So, we commit to designing professional learning in ways that attend to identity, belonging, and empowerment.

Background Research that Informed the Science Equity Framework Matrix

High-quality professional learning for the Next Generation Science Standards (NGSS) is characterized by sustained, collaborative, and job-embedded learning experiences that support educators in deeply understanding and implementing the standards. It emphasizes inquiry-based approaches to teaching science, promoting three-dimensional learning that integrates disciplinary core ideas, science and engineering practices, and crosscutting concepts. Effective professional development also fosters continuous reflection, promotes the integration of real-world phenomena, and provides educators with the tools and strategies to create inclusive, student-centered learning environments that align with the goals of NGSS and at the same time meet the diverse needs of all students. By committing to ongoing reflection, collaboration, and examination of teaching and learning outcomes, educators can ensure their instructional practices evolve towards more just and equitable learning environments. Some of the research-base that informed the elements outlined in the *Framework Matrix* include:

- California Science Curriculum Framework (Chapter 12, CDE, 2016)
- Designing Professional Development for Teachers of Science and Mathematics (Ch. 4, 2010)
- Quality Professional Learning Standards (CDE, 2015)
- The Elements: Transforming Teaching through Curriculum-Based Professional Learning (Carnegie Corporation, 2020)
- What Educators Can Learn about NGSS Implementation in California: Highlights from the Early Implementer Initiative (WestEd, 2020)
- The Brilliance of Children and the Strengths of Educators (National Academies, 2022)
- Equity in K-12 STEM Education (National Academies, 2024)

Additional resources examined by the SST are linked in this Padlet.

Organization of the Science Equity Framework Matrix

As a whole, the *Science Equity Framework Matrix* provides a view of how professional learning can lead to improved educators' knowledge, practices, and dispositions and, at the same time, increase equitable learning opportunities for students. In Table 2 below, the *Beliefs+Commitment* column (to the left) provides specificity about the beliefs that uphold the SST's commitments towards equity in professional learning. The *Specific Practices, Actions + Features* column (to the right) describes which actions should be taken to realize the commitments in professional learning spaces. While each commitment is important on its own, they are designed to overlap and complement each other. By reflecting, adopting, and adapting the corresponding practices, actions, and features, facilitators of professional learning embrace and bring to life the shared commitments towards equity.

Table 2: Partial Section of the *Science Equity Framework Matrix*

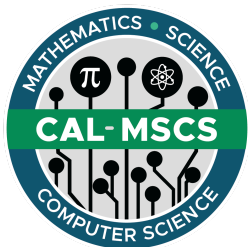| CAL-MSCS Science Steering Team: Science Equity Framework Matrix Ensuring Equity in Science Professional Learning Experiences and Systems[1]	
Beliefs+Commitments *What does "ensuring equity" mean for science teaching and learning?*	**Specific actions, features, and practices of professional learning (PL) facilitators** *How will we ensure equity in science professional learning experiences and systems? What does it look, sound, feel like in PL experiences and in PL systems?*
1 - We believe all students are capable of excelling in science. So, we commit to *designing professional learning experiences and systems of professional learning with each **student's success** in mind.*	
Commitments	**Actions, Features, and Practices for PL Facilitators**
1.A We will attend to access and inclusion by providing intentional opportunities for students to make connections to their	PL facilitators: • Include imagery, videos, texts, authors, etc. that display a wide variety of diverse representations of people of non-dominant identities engaging in science actions. • Intentionally select materials that can make learning accessible for participants in

Suggestions for How to Use the Science Equity Framework Matrix

Professional learning that focuses on equitable access, opportunities, and outcomes for all students is embedded in a system in which school leaders, district staff, teacher leaders, and all educators with a responsibility to teach students are committed to creating a culture and structure for continuous learning and improvement. The *Science Equity Framework Matrix* can be a valuable reference point for helping all members of an education community examine and sustain a professional learning experience that builds their capacity to improve how they lead, teach, and learn through the lens of equity. In this sense, the elements of the *Framework Matrix* should be used to reflect, inform, and adapt professional learning experiences that fits specific contexts and needs. An individual might hold multiple roles at any given time in the educational system and therefore use multiple lenses.

Table 3: Suggestions for use of the *Science Equity Framework Matrix* by role

If you are...	Try This
Classroom teacher or other educator	As you participate in professional learning, use the *Framework Matrix* to reflect on how your own identities, ideas, and practices are aligned with the learning experiences you engage in.
School or district leader	As you make space for professional learning experiences for your educators, use the *Framework Matrix* to consider which cultures and structures could be most favorable to support educators in engaging in professional learning.
PL facilitator	Use the *Framework Matrix* as you design, deliver, and subsequently reflect on your facilitation; consider which elements of were successful and which may require further practice.

CAL-MSCS Science Steering Team

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[Front Matter HERE](#)

CAL-MSCS Science Steering Team: Science Equity Framework Matrix Ensuring Equity in Science Professional Learning Experiences and Systems[1]	
Beliefs+Commitments *What does "ensuring equity" mean for science teaching and learning?*	**Specific actions, features, and practices of professional learning (PL) facilitators** *How will we ensure equity in science professional learning experiences and systems?* *What does it look, sound, feel like in PL experiences and in PL systems?*
1 - We believe all students are capable of excelling in science. So, we commit to *designing professional learning experiences and systems of professional learning with each **student's success** in mind.*	
Commitments	**Actions, Features, and Practices for PL Facilitators**
1.A. We will attend to access and inclusion by providing intentional opportunities for students to make connections to their prior experiences (science or otherwise).	PL facilitators: ● Include imagery, videos, texts, authors, etc. that display a wide variety of diverse representations of people of non-dominant identities engaging in science actions. ● Intentionally select materials that can make learning accessible for participants in

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[1] For a review of the research base for this work look at the specific paragraph in the [Front Matter](#).

1.B. We will incorporate student voice and/or understanding of student perspective into the design of all support and programming.	explicit ways (e.g., [Universal Designs for Learning] or UDL, language, and cognitive demand). Provide opportunities for participants to critically reflect around approaches for including their students' experiences into their lesson design . ● Provide participants the opportunity to engage with student artifacts (e.g. student work samples, classroom videos, etc.) or authentic street data (e.g. student panels, interviews, voice recordings, vignettes, etc.) ● Provide intentional opportunities for participants to build community by sharing aspects of their 'deep culture'. Participants share and affirm their own life experiences with each other, while critically reflecting on how they can provide similar opportunities for students within their teaching and learning environments.
1.C. We will provide opportunities to shift the mindsets of "decision-maker-professionals," at all levels of state and local education system (e.g., science teachers, counselors, instructional leaders, PK-12 system leaders, community partners, designers of science experiences, paraprofessionals and other educators), away from the objectivity myth of science.	PL facilitators: ● Strengthen the cultural competence of participants by recognizing and incorporating opportunities for them to engage in diverse cultural ways of doing science and developing knowledge (e.g., sense-making), intentionally problematizing the myths of the nature of science (e.g. objectivity, a single linear "scientific method", etc.) in order to expand the meaning of what it means to be a scientist. ● Proactively lift up and name non-Western ways of defining and doing science.
1.D. We will model the principles of universal design for learning (UDL) in the design and delivery of all support and programming provided to educators and community partners in ways that support them to do the same for students.	PL facilitators: ● Conform all PL resources for basic accessibility compliance (for example, use 12 pt font and above for printed materials introduced in PL). ● Provide close captioned or written transcripts of all videos shown ● Provide multiple ways for engagement (learner's interests and sources of motivation) ● Elicit and recognize participants' preferred modes of engagement. ● Engage participants in learning that attends to the [UDL] principles, moving participants from the basics towards more advanced design features (e.g. attend to learners' interests and sources of motivation).
1.E. We will provide a bridge for science educators to apply what they learn in PL to the teaching and learning environments.	PL facilitators: ● Plan for time to reflect, discuss, and envision application in local context in collaboration with other educators.

• Build the capacity of the leaders who support educators to engender healthy, thriving, sci-ed supportive K-12 school contexts and cultures characterized by sustained professional learning and growth opportunities.	• Create opportunities for follow-up subsequent to the PL (virtually or otherwise) so as to allow participants to discuss the implementation of their plans. • Employ discussion protocols to effectively facilitate conversations in which all perspectives are affirmed.
1. F. We will prioritize the local context by centering place-based knowledge in professional learning, modeling ways for educators and leaders to honor student and community knowledge, experiences, and motivations.	PL facilitators: • Take the time to learn about PL participants, their place of work, including practices and policies in their context that may impact their PL learning • Take the time to learn about the communities served by the education system the PL is supporting. • Provide space for PL participants to consider the local context of their students and/or communities in which they teach. • Build community with and between PL participants, learning more about each other's *'deep culture.'* • Create PL learning environments that are representative of the community and cultural funds of knowledge, experiences, and motivations. • Bring PL into different contexts like outdoors and into the community. • Prioritize collaborating with and providing PL to more geographically remote, less visible or less resourced contexts (e.g. rural school districts, independent study schools, etc.)

2 - We believe all educators are capable of fully serving students. So, we commit to *designing with each **educator's success** in mind.*

2.A. We will provide opportunities for educators and partners to "see" classroom instruction that reflects the shifts called for through the 3 dimensions of the CA-NGSS (Science and Engineering Practices, Crosscutting Concepts, and Disciplinary Core Ideas), as well as opportunities to	PL facilitators: • Provide participants with a copy of the Instructional Shifts Required by the CA-NGSS ([CA Science Framework](#) Table 1.2) and embed opportunities to reflect on how these shifts were evident within the PL experiences. • Use NGSS aligned and HQIM (high quality instructional materials) in the PL environment that engages participants in CA-NGSS aligned learning experiences.

surface and negotiate beliefs about these shifts.	- When feasible, <u>co-create PL agreements</u> or provide <u>PL agreements</u> with opportunities for participant refinement that value and make visible the assets of each participant and the ways they want to engage in collaborative sensemaking. - Monitor and encourage group ownership of upholding PL agreements within the learning community. - Strategically embed time for participants to debrief their learning experiences so as to reflect on whose knowledge, practices, and identities were valued in the experience. (ex. Indigenous, rural, multigenerational, place and history). - Model metacognition for participants and make explicit where in the PL the activities were intentionally designed for expanding opportunities for sensemaking. - Engage participants in learning experiences of science that align to the CA-NGSS with a social justice focus.
2.B. We will offer professional learning that enables participants to explore their own identities as educators, designers of curriculum, and mentors and also empowers them as change agents in the system.	PL facilitators: - Incorporate the reading and discussion of resources that highlight the importance of educators as *transformative intellectuals*. - Intentionally plan for <u>identity activities</u> that surface the multiple intersecting identities impacting the science learning and support participants grappling with the question of "Who am I as an adult learning in this space?" - Support participants in recognizing their own positionality in the PL environment, intentionally plan for how power and decision-making will be distributed among all identities in the space, and offer opportunities for participants to consider their own positionality with respect to peers, students, communities, and science as a discipline.
2.C. We will attend to inclusion and access by using multiple delivery modalities for the support and programming we provide, in order to reach even more educators in historically and currently marginalized communities (along racial, socioeconomic and geographic lines).	PL facilitators: - Gather information from PL participants (e.g. through surveys and in the moment) so as to determine the most appropriate modalities (e.g. synchronous/asynchronous, in-person/hybrid/virtual, fixed/self paced) for participants to engage in the PL. - Gather information on preferred PL modalities, including levels of technology integration, more than once throughout the PL engagement. - Consider the PL modality impact to participants with varying levels of technology proficiency.

	- Use in PL design individual, paired, triad and group configurations to allow for multiple ways of interacting collaboratively. - Provide opportunities for choice in processing style: quiet independent processing time vs. collaborative verbal processing. - Make visible the multiple strategies (ex. CER, pairs share, etc.) available for sensemaking around phenomenon and the materials and activities to support understanding of the phenomenon.
2.D. We will attend to the prior science learning and individual experiences (positive or negative) of the educators, leaders and community partners we serve in student-centered ways, in order to "fill their buckets" as humans and learners and support them to design for students in similar ways.	PL facilitators: - Review on your own and/or with your PL participants the CA SBE Policy on the <u>Teaching Natural Sciences</u> in CA K-12 Public Schools. - Connect to <u>Transformative SEL</u> strategies within the PL design as a model for ways to increase wellness and agency. - Use experiential learnings to expand thinking on science teaching and learning emphasizing the prioritization of engagement. - Embed opportunities to surface the ways in which science has historically been used against marginalized groups and how those communities are still impacted today.
2.E. We will design and deliver learning opportunities that provide educators and partners with the kinds of learning experiences students engage in, and develop their agency with science in action whether classroom culture or on a larger community or societal scales.	PL facilitators: - Define and elevate the three dimensions of NGSS in the design of PL science activities. - Where connections exist, introduce <u>Sustainable Development Goals</u> (SDG) for consideration to the larger role science plays in human endeavors. - When the opportunity presents itself, work with educators in settings outside of the classroom to learn science. - Create brave spaces for learning that are emotionally and intellectually safe for participants to engage in conversations around injustices in science, teaching, and learning. - Recognize the contributions of marginalized populations and/or nondominant cultures to the advancement of scientific knowledge and point out when credits for advancements were misattributed (e.g. Pacific Island nations' ability to navigate by stars predates Europeans', African knowledge of inoculations predates modern vaccinations, Watson & Crick's DNA structure proposal capitalizing on Franklin's experimental results without giving her credit)

	● Engage participants in understanding how scientific knowledge and practices are continuously developing and how their own community histories, values, and practices contributed and continue to contribute to scientific sensemaking

2.F. We will leverage resources to help educator minds' and hearts' shift into instructional changes that positively benefit students; this includes incorporating *the* principles of universal design for learning ([UDL](#)), socioemotional learning ([SEL](#)), and culturally and linguistically sustaining learning ([CSP](#)) into the design and delivery of all support and programming.	PL facilitators:
	● Explicitly drawing participants' attention to how the inclusion of UDL, SEL, and CSP strategies create a stronger sense of learner agency as well as emotional, intellectual, and cultural connections with the learning experience.
	● Incorporate the principles of [SEL](#) in the PL design by:
	   ○ Providing tools and opportunities for self-regulation (fidget tools, movement breaks, reflection guides, spaces to doodle, etc.)
	   ○ Inviting emotions into the conversation when reflecting and debriefing learning experiences (e.g. "How did you feel as you engaged in that activity/learning task?" or "What emotions surfaced for you as a learner?")
	   ○ Fostering caring communities where each participant is treated fairly and respectfully by everyone and allow participants to be vulnerable and take risks in their learning
	   ○ Modeling a progression of activities and conversations that lead to an increase in collaboration, building of trust, and relationship-building which ultimately result in collaborative problem solving and increased self-efficacy.
	● Incorporate culturally and linguistically sustaining learning practices ([CSP](#)) by:
	   ○ Monitoring and attending to the affective responses of participants when facilitating.
	   ○ Recognizing and honoring the assets of diverse cultural and linguistic backgrounds.
	   ○ Attending and listening to participants' diverse ideas and ways of engaging in science and engineering practices.
	   ○ Actively eliciting, recognizing, and supporting participants in using their sensemaking repertoires and experiences.

3 - We believe the best professional learning shifts educator mindsets and practice and supports educators and students to thrive. So, we commit to *designing in ways that attend to **identity, belonging, and empowerment***.	
3.A. We will offer learning and capacity building opportunities for educators, system leaders, and their partners that are ongoing and sustainable (applying the principle of "repeated exposure"), engaging all "end users" in the design of support and programming to ensure participation, buy-in, and authenticity of involvement.	PL facilitators: ● Establish shared ways to receive and communicate feedback on PL work to ensure these opportunities are designed so that participants engage in professional work that is directly applicable to their school's contexts and communities. ● Provide short resources for systems leaders on the research on learning (e.g. "How People Learn" main ideas/summary). ● Negotiate with educators, system leaders and their partners the most appropriate ways to engage in collaborative PL work that provide ongoing and sustained opportunities to learn, plan, try out, and reflect.
3.B. We will offer opportunities for educators and system leaders and their partners to ● collectively define, understand and embrace a shared vision for science teaching and learning ● experience modeled practices that align with our shared vision of quality science teaching and learning ● continually reflect upon and map current community assets and needs for science teaching and learning	PL facilitators: ● Use appropriate resources to monitor ongoing participants' learning, for example, exit surveys, gots-needs, pre and post assessments to understand how the PL helped the group expand their learning. ● Explore and leverage participants' district/organization goals and/or vision statements to identify alignment between new or existing science efforts, the intended outcomes of the PL, and shifts in instructional practices. ● Gather PL participants' ideas (individually and collaboratively) about how engaging in science looks, sound, and feels like. Then, allow participants time to revisit their vision and revise it in light of their new understanding. ● Create space during PL to engage participants in ongoing reflections and conversations around their current thinking, where they would like to go next, and what resources they need to move to the next step in relation to their vision for science teaching and learning. ● Create PL that may challenge current assumptions, thinking, and practices to help participants reflect on what they know and do and why, modeling practices that support this where possible.
3.C. We will attend to the principles of	PL facilitators:

| justice-centered learning to honor place-based knowledge, community strengths, and meaningfully support local science learning and the social goals of their communities. | Review justice-centered frameworks for inclusion of strategies within the PL and into participants' teaching and learning environment. Engage participants in local/contextualize asset mapping as part of embedded PL reflection (e.g., identify community partners to support science initiatives). Attend to conversations that challenge a narrow view of belonging and doing science. Provide learning experiences in which participant school communities, cultures and needs are prioritized. Co-create learning experiences that nurture scientific thinking and that are relevant and meaningful to participants. |