FEBRUARY 2018 | EVALUATION REPORT #4

Developing District Plans for NGSS Implementation

Preventing Detours and Finding Express Lanes on the Journey to Implement the New Science Standards

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NGSS EARLY IMPLEMENTERS

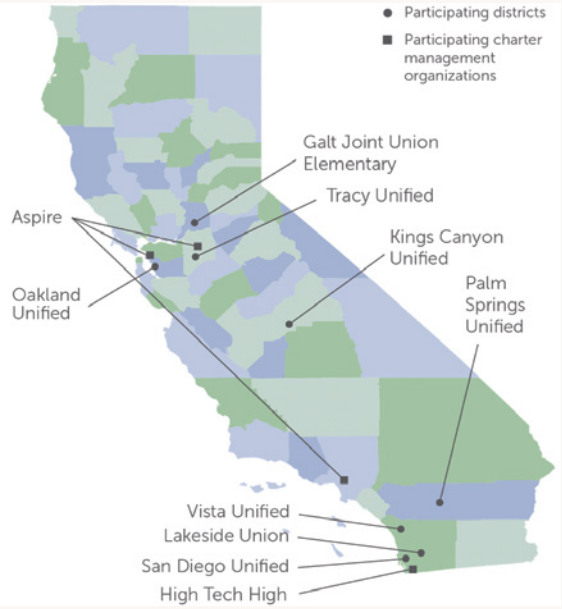
WestEd

To provide readers with practical examples, the appendices include over 40 pages of sample components of districts' NGSS implementation plans.

NGSS Early Implementers Initiative: Bringing science to life as a core subject in K–8 classrooms

A diverse group of eight California school districts and two charter management organizations is actively implementing the Next Generation Science Standards (NGSS). Their progress, experiences, and lessons can inform others implementing the NGSS. The NGSS Early Implementers are supported by the K–12 Alliance at WestEd, and work in partnership with the California Department of Education, the California State Board of Education, and Achieve. Initiative funding is provided by the S. D. Bechtel, Jr. Foundation, with the Hastings/Quillin Fund supporting participation by the charter organizations.

The Initiative spans 2014 to 2020. It focuses on NGSS implementation in grades K–8 and incorporates the integrated course model (preferred by the California State Board of Education) for middle school.



Teachers are supported with strategies and tools, including an instructional framework that incorporates phenomena-based learning. This framework aligns with the NGSS three dimensions: disciplinary core ideas, crosscutting concepts, and science and engineering practices. Using science notebooks, questioning strategies, and other approaches, students conduct investigations, construct arguments, analyze text, practice descriptive skills, articulate ideas, and assess their own understanding.

Teachers engage in science lesson studies twice each year through a Teaching Learning Collaborative. In each district, the Initiative is guided by a Core Leadership Team of Teacher Leaders and administrators who participate in additional professional learning and coaching activities. Together, this core team and an extended group of Teacher Leaders are the means for scaling NGSS implementation throughout the district.

Learn more about this multi-year initiative and access evaluation findings as well as instructional resources at k12alliance.org/ca-ngss.php.

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Evaluation of the NGSS Early Implementers Initiative

The S. D. Bechtel, Jr. Foundation commissions WestEd's STEM Evaluation Unit to evaluate the NGSS Early Implementers Initiative in the eight participating public school districts. This independent evaluation is advised by a technical working group that includes representatives of the California Department of Education and the State Board of Education. Evaluators investigate three main aspects of the Initiative's NGSS implementation:

- districts' local implementation,
- implementation support provided by K–12 Alliance, and
- the resulting science teaching and leadership growth of teachers and administrators, as well as student outcomes.

In addition to this current Report #4, evaluators previously released:

Moving the Needle (Report #1, October 2016), which describes the Initiative's early progress on three implementation goals: integrating science and ELA, integrating the sciences in middle school, and making science a core school subject.

The Synergy of Science and English Language Arts (Report #2, October 2017), which updates and expands the topic of integrating science and ELA, including describing what such integration can look like in the classroom.

Administrators Matter in NGSS Implementation: How School and District Leaders are Making Science Happen (Report #3, November 2017), which describes how administrators are advancing NGSS implementation in their schools and districts, how teachers are benefitting from administrators' support, and how the Initiative is empowering administrators' efforts.

Evaluators plan future reports on these topics:

- Guide to tools and strategies for NGSS implementation (winter 2018)
- What middle school science integration looks like in the classroom (summer 2018)
- Teacher leadership (summer 2018)
- Changed student interest in science (summer 2018)

Executive Summary

Many California districts are ramping up their efforts to enhance science teaching, in part because of the new California Science Test (CAST) coming online. The CAST is aligned with the revised California Science Framework, which mirrors the Next Generation Science Standards (NGSS). The NGSS call for substantial changes in science teaching and learning. Given this context, how are districts escalating their attention to NGSS implementation?

The K–8 Early Implementers Initiative has found that careful planning is critical. With thin planning, unexpected detours or dead ends are likely. However, with solid planning, districts are more likely to achieve their implementation goals and may discover some express lanes for their implementation journey!

In this evaluation report, we document lessons learned by the Early Implementer districts through their development and use of master district plans for NGSS implementation. Intended for district-level administrators and state education policymakers, this report is the fourth in a series of evaluation releases. The report is based primarily on inspection of districts' thorough NGSS implementation plans and extensive interviews with district project directors and the regional directors from WestEd's K–12 Alliance.

The report's main topics are:

- Benefits of developing an NGSS implementation plan
- Processes used to develop plan components, including overcoming challenges
- Recommendations for developing plans
- Sample components of districts' NGSS implementation plans

We hope that readers will not be put off by the report's seemingly large size. While the main narrative is relatively brief, the report also provides over 40 pages of practical samples in the appendix to give readers a clear idea of what goes into a thorough NGSS implementation plan. As readers will have different interests and needs, we included a wide variety of examples.

Benefits of Developing an NGSS Implementation Plan

Soliciting input from a wide variety of stakeholders — including teachers and administrators at both school and district levels — was critical for gaining multiple perspectives and achieving buy-in for executing the plan. The substantial planning process enhanced participating teachers' understanding of the workings of the district, empowering them to become systemic change agents for the district's NGSS implementation. For example, teachers became more knowledgeable about avenues for being included in districts' annual LCAP decisions. In addition, by beginning the process with a needs assessment that typically involved collecting data from teachers and others, the plans addressed local concerns and conveyed authenticity to stakeholders as the plans were being rolled out.

Developing the Plan Components: Process and Challenges

The report describes how districts established teams to help plan and implement the NGSS, and how these teams developed five main components for their plans. The process involved:

- Conducting a needs assessment
- Creating clear goals through vision and mission statements
- Systematically addressing a full range of plan elements (i.e., instruction/teaching, professional learning, curriculum/resources, assessment, community/parent engagement, policies/practices, and equity)
- Creating an action plan
- Identifying ways of monitoring and evaluating progress on implementing the plan

The report also discusses challenges faced by district planning teams, including recognizing that adequate planning takes substantial work and time; thinking of everything important to include in the plan, while also not getting distracted by issues at too small of a grain size; and seriously addressing equity issues.

Recommendations for Districts Putting Together NGSS Implementation Plans

The main narrative of the report concludes by summarizing the following recommendations that Project Directors had for other districts endeavoring to draft their own NGSS implementation plans:

- Engage a wide range of stakeholders, including central office staff
- Gather and attend to needs-assessment data
- Do what works for your local context
- Share the plan widely
- Go slow to go fast
- Maintain a living document
- Keep in mind the larger purpose of effectively engaging all students in science

Appendices

The report's appendix contains over 40 pages of examples of each of the five major components of the district plans (i.e., needs assessment, vision and mission statements, core values and operating principles, program elements matrix, and a monitoring and evaluation plan). The appendix also lists other seminal reports on making district NGSS plans.

Introduction

For our district, the NGSS implementation plan was a very, very important thing. In the plan, we had to indicate where we thought it was going to happen, when we thought it was going to happen, and what it was going to cost.
— District Project Director

Educators typically are eager to dive directly into tackling the many pressing needs around them, rather than first discussing the challenges and making an action plan. However, it is critical to adequately plan before undertaking any major implementation effort. If you don't plan well for the journey ahead of you, it's almost inevitable that you'll run into unexpected detours or even permanent roadblocks. If you plan well, you'll be clearer about what implementation goals you are pursuing, and you'll be much more likely to achieve those goals. And you might discover some express lanes to take during your implementation journey!

Implementing the Next Generation Science Standards (NGSS Lead States, 2013) is indeed a major undertaking, and not just because implementing them is a large effort. The NGSS are a qualitatively big change. They require substantial changes in science teaching and learning, not merely a tweak or update. Further, keep in mind that for many years many elementary teachers in California have been teaching very little science due to the focus on English language arts and mathematics. Indeed, it will take some earnest planning to be successful in bringing the exciting new science learning opportunities of NGSS to all students.

Accordingly, the Core Leadership Team in each district of the NGSS Early Implementers Initiative, which focuses on grades K–8, spent much of the first 12–18 months of the four-year Initiative developing comprehensive implementation plans. The teams' work was facilitated by each district's full-time Project Director for the Early Implementers Initiative. WestEd's K–12 Alliance provided in-depth training and some tools to guide the local planning, and the K–12 Alliance's Regional Director for each district aided the Core Leadership Teams during at least six all-day planning sessions per school year. Districts were free to tailor both the process and the content of the NGSS implementation plan to their local circumstances. Completed and signed by the district Superintendent, each NGSS implementation plan served as both a roadmap for the Core Leadership Team's NGSS rollout work and proof of commitment that the team could point to if needed over the course of the Initiative.

This report — intended for state and district leaders — describes the benefits of developing an NGSS implementation plan, both initially and as the plans were executed over time; the components addressed in each plan; and the challenges of the process of developing an NGSS implementation plan. The report concludes with overarching recommendations for creating plans. Appendices provide additional resources, including a list of reports from leading organizations offering NGSS implementation advice, as well as many practical examples taken from Early Implementer districts' NGSS plans.

We hope this report will be useful to the many California districts that will be ramping up their NGSS implementation efforts next school year (2018–19) as the new NGSS-aligned state science test comes fully online.

Benefits of Developing a Plan

The process for developing NGSS implementation plans was intensive and of enormous benefit to the participating districts. Project Directors, who had primary responsibility for shepherding the Core Leadership Teams through the writing of the district plan, were asked about the most successful aspects of the planning process. Highlights from their responses are presented below.

Made the Team a Team

The Core Leadership Teams were newly created with the advent of the Early Implementers Initiative. The teams brought together teachers and administrators from throughout their respective districts, representing an array of different perspectives, knowledge, and experiences. Aside from the non-trivial job of learning about the substantial differences present in the new standards, their first job was to work together to develop a clear and complete plan for implementing the NGSS in all schools in their district.

Having such "unity in purpose" fostered cohesion among team members, said one Project Director. The planning process also established functional relationships that were indispensable later for collaboratively addressing the challenges of ambitious implementation efforts.

Achieved Broad Buy-In

The K–12 Alliance counseled districts to make a point of involving appropriate stakeholders beyond the Core Leadership Team. In fact, many of the Project Directors remarked that one of the most successful parts of the planning process was involving a cross section of district personnel. While it was sometimes challenging to balance multiple interests, it was very important for buy-in and credibility to involve many grade levels, multiple schools, and both administrators and teachers on the team.

The range of different perspectives on both the current status and long-term goals for science instruction was "invaluable" for guiding the plan. An important side-effect of this strategy was that more people in a wider range of roles in the district were aware of the Early Implementers Initiative and the plan to involve a significant proportion of the teachers in it. "Refining the plan and kind of looking toward the future from different perspectives was very important in terms of guiding the work that we were doing in the district. Having that wide breadth of thinking from different sections of the district was very helpful," said one Project Director.

Created Empowered Change Agents

Making professional connections with a range of constituents allowed members of the Core

Leadership Team to begin to discover who had influence in the district and how to access them. In some districts, links to the Local Control and Accountability Plan (LCAP)[1] were forged early on. One Project Director joined the LCAP committee, another developed a key ally at the district office who continued to be a source of crucial support throughout the course of the Initiative. Some Core Leadership Team members and Project Directors met or presented information to the Superintendent, the Assistant Superintendent of Curriculum and Instruction, convenings of district administrators, and the School Board of Education.

Raising awareness on the part of these key individuals was instrumental in getting the message out that science was a core subject. A district annual report confirms this: "Strategic and purposeful placement of Early Implementers teachers on district decision-making committees like the District or Site Instructional Leadership Team, Professional Learning Planning Committee, and LCAP Committees and subcommittees have allowed the voice of science to be heard more clearly and more often." A Project Director reiterated this point: "Having a plan helped us determine how we could 'create influence' in the district, which could help us gain access to LCAP funds." Through the NGSS planning process, Core Leadership Team members gained important knowledge about how changes are made in their districts. This benefit of the district plan provides one example illustrating the strong teacher leadership growth model that is an integral part of the Early Implementers Initiative.[2]

Produced Data on Needs and Wants

Under the guidance of the K–12 Alliance and the Regional Directors, each Early Implementers district carried out substantial needs assessment activities. The activities included administering extensive surveys of teachers of science, and gathering ideas from administrators, parents, and the community through a combination of surveys, discussions, and focus groups. These efforts provided a range of critical input: evidence of the current state of science instruction, perceived needs on the part of different stakeholders, level of willingness of teachers to experiment with the new standards in their classrooms, and feelings about the existing strengths in the districts that could be harnessed for science.

This evidence was very useful when making the case for science with district policymakers. Said one Project Director, "Having numbers and data was super powerful." Further, Project Directors noted that the data also helped the team stay grounded in reality: "It did cause us to reflect on where we actually were and not just where we wanted to be. It helped our team really think about what the evidence showed."

Secured LCAP Support for NGSS

In many Early Implementer districts, the NGSS implementation plan either paved the way for new connections to the LCAP or directly influenced how science education was included in the important district planning process for the LCAP.

1 According to the California Department of Education's website, "The LCAP is a three-year plan that describes the goals, actions, services, and expenditures to support positive student outcomes that address state and local priorities." (n.d.) Retrieved from https://www.cde.ca.gov/re/lc/

2 Note that a future evaluation report on teacher leadership is slated for release in August 2018.

The importance of the NGSS implementation plan to the district LCAP was made explicit in one district's plan:

> *In developing the NGSS district plan, connections have been made within the LCAP process to receive input from the community to guide NGSS efforts. This community input provided the interest and rationale for the superintendent to include the NGSS as a focus along with Common Core and other district priorities.*

Having cost data was the key to getting LCAP funding, as explained by one Project Director:

> *Writing the plan really made us think deeply about what we needed, and that was incredibly helpful when it came time for LCAP. Then it was a matter of "Being in the right place, at the right time, with a plan." At LCAP meetings, we were able to say to the Assistant Superintendent of Business Services, "We need X materials, or X things, and this is how much it's going to cost." It made her job easier, and we got what we asked for.*

Other teams were similarly able to speak knowledgeably when requesting funds for materials, supplies, equipment, and release time. The following annual district report excerpt (June 2017) listed ways that the NGSS implementation plan had been instrumental:

> *The District NGSS Implementation Plan has guided the work with the LCAP and budget allocations by:*
>
> - *Providing an outline of the professional learning needed to gradually increase district-wide NGSS implementation with inquiry-based sense-making pedagogy*
> - *Delineating a gradual timeline for developing and/or purchasing NGSS aligned resources for teacher use in the classroom*
> - *Outlining a teacher leadership structure that builds capacity for bringing about system-wide change and implementation*
> - *Listing actions . . . to address the multi-layered approach it takes to accomplish district-wide change*

Minimized the Unexpected

The process of thinking through the many specific steps to take and the supports needed to implement NGSS helped districts avoid some roadblocks and detours that otherwise could have derailed the teams' work, and it also created some express lanes for accelerating progress on critical steps. For example, during early stages of planning in one district, the district policies that posed obstacles to NGSS implementation were identified, and the team was able to begin to address those issues:

> *Our Survey/Needs Assessment data showed that there was a significant difference between what the district thought they were communicating in terms of science instruction (priority, number of*

minutes, etc.) and what teachers felt was "implied" policy. This was true regardless of how teachers were directed by site or district admin. For example, if the ELA materials said they needed X minutes a day, that is what many teachers did — to the detriment of science time. We were able to clarify the message that it was OK to teach more science. Additionally, we got the superintendent to write a letter to staff and parents indicating that people should be starting to transition to NGSS and to deemphasize the old CST [California Science Test] assessment to help make that transition OK for teachers. — Project Director

Created a Gauge for Monitoring Progress

One of the most useful parts of the district NGSS implementation plans, according to more than half of the Project Directors, has been that the plan enables districts to gauge their progress against clearly defined goals. Said one Project Director:

It's been useful to see and appreciate how far we have moved, to look at our accomplishments and challenges and the reasons for both so we know what's making us move forward and what's keeping us back. It's good to kind of ground ourselves...It's easy to get bogged down in the daily grind. We need to step back and be of three minds: the present (keeps us going day to day), crisis mode (there are budget issues, maybe we are going to lose somebody), and looking forward to next year and the year after to make it successful. And the plan helps — it takes us away from only focusing on crisis and day to day.

Developing the District Plan Components

When embarking on the process of developing NGSS implementation plans, each Core Leadership Team was able to build on the thinking and writing that had gone into the detailed applications they'd generated to join the NGSS Early Implementers Initiative. Nonetheless, the teams spent up to 18 months following a series of steps suggested by the K–12 Alliance before their plans were complete. The teams were provided guidance by the K–12 Alliance, but districts were free to tailor both the process and the content of the plan according to their own circumstances. Completed and signed by the district Superintendent, each plan served as both a roadmap for the Core Leadership Team's NGSS rollout work and proof of commitment that the team could point to if needed.

The NGSS Early Implementers process strongly followed two overarching NGSS implementation planning principles recommended by Achieve (2017, p. 2), an organizational partner in the Initiative:

- Planning is an essential part of the work
- The practice of leading involves many people in a variety of roles and with various amounts of authority

Establishing a Team

In each district, the Early Implementers Project Director recruited a Core Leadership Team of five to eight teachers and three to five administrators, including representation from elementary and middle school, to help plan and support NGSS implementation in the district for the four-year duration of the Initiative. The K–12 Alliance had recommended having a district-level administrator on the team, but this was not achieved in most districts. The districts were assigned one K–12 Alliance Regional Director who met with the teams a total of six times each year for technical assistance days.

During those meetings, as well as convenings without the Regional Director, the teams worked on their district plans for NGSS implementation. Teams discussed existing circumstances related to science instruction in their districts and carefully considered what data they would need to inform their plans and visions. Some used their application to join the Early Implementers Initiative as a starting point, and the Regional Directors led the district groups through a series of activities and assignments for developing their plans. The K–12 Alliance uses the Seven Norms for Collaborative Work (Garmston & Wellman, 1999) to help teams work more efficiently with each other.[3] (See Appendix B for more about the Seven Norms for Collaborative Work.)

3 The original norms, often called the Norms of Collaboration, have been modified by Garmston and Wellman and adapted by the K–12 Alliance.

Table 1. Ratings of plan component usefulness on scale of 1 to 10

Components	Average Score	PD 1	PD 2	PD 3	PD 4	PD 5	PD 6	PD 7
Needs assessment	9.4	10	10	9	10	10	8	9
Vision, mission, values, principles	8.0	8	9	7	8	9	5	10
Program Elements Matrix (PEM)	9.4	10	8	10	8	10	10	10
Action plan	8.4	8	9	10	9	8	6	9
Monitoring/evaluation plan	7.6	9	7	8	9	?*	6	7

* One replacement Project Director could not provide a rating on the Monitoring/Evaluation component. (Another replacement Project Director was not able to provide any retrospective ratings.)

Source: Fall 2017 interviews.

Plan Components

The K–12 Alliance provided the Core Leadership Teams with tools and a process to guide the development of long-range district plans for implementing the NGSS. The teams were guided through recommended steps so that all district NGSS implementation plans included the same main components: *needs assessment*; *vision, mission, values, and principles*; *Program Elements Matrix*; *action plan*; and *monitoring and evaluation plan*.

When asked to rate each of the plan components for usefulness, Project Directors consistently rated the PEM as the most useful. Five out of seven Project Directors rated the PEM a "10," on a scale of 1 to 10. The next most useful component, according to Project Directors, was the needs assessment, which was given a rating of "10" by four out of seven Project Directors. The full set of ratings of each plan component by the seven Project Directors is shown in Table 1.

At the request of the K–12 Alliance, the districts also included in their plans a brief discussion of the following three topics:

- A plan for integrating NGSS and the Common Core State Standards (CCSS) — All districts were in the process of implementing the CCSS. Because both the CCSS and the NGSS call for integration with each another, the K–12 Alliance prompted the Core Leadership Teams to address how they intended to support science integration with the CCSS.[4]
- The middle school integrated model — In order to participate in the Early Implementers Initiative, districts were required to commit to adopting the middle school integrated model, the preferred model of the California Department of Education. Each district had to include a brief plan for transitioning to the new model.
- The status of environmental education — One of several ways that the NGSS support environmental education is through their

4 A previous NGSS Early Implementers Initiative evaluation report (#2), *The Synergy of Science and English Language Arts,* discusses this topic in detail. Previous evaluation reports can be found here: http://k12alliance.org/ca-ngss.php. Future evaluation reports also are planned on how districts address the other two plan components: the integrated science model and environmental education.

inclusion of human impact in the context of Earth and Space Science. Each district's plan described current environmental education (EE) programs already in place, if any; identified local resources that could be used in expanding or creating new EE programs or activities; and described a plan for setting up new EE programs or a commitment to do so.

Needs Assessment

In developing their NGSS implementation plans, the teams were embarking on an ambitious journey that would impact their entire districts. All Early Implementer districts began the planning process with a needs assessment, which involved collecting data about existing realities in the district and soliciting input from a wide range of stakeholders, including teachers, administrators, parents, and community members, about perceived needs related to science instruction. Both formal and informal methods were used, and recently collected information for the plan was synthesized with data generated previously for the Early Implementers Initiative application. These data provided evidence to other readers of the NGSS implementation plan that the document reflected ideas contributed by a wide array of stakeholders in the district and community at large.

The needs assessment activities focused on the Core Leadership Team first and were later expanded to include other teachers in the district. In most of the districts, survey data was collected from the 30–70 participating Teacher Leaders. Two of the districts administered surveys to every teacher who taught science. (See Appendix C for a sample Needs Assessment questionnaire.) Teachers in certain districts were asked:

- How much (# of minutes) science they were typically teaching per week (elementary)
- How much of their science teaching involved hands-on or small group work
- How prepared they felt to use formative assessment to guide science instruction
- How prepared they felt to integrate science with English language arts (ELA) and math
- What kept them from teaching more science involving active/hands-on learning
- What they felt were existing strengths in the district that would support quality science/NGSS instruction in all classrooms by the 2017–18 academic year
- About their willingness to try out NGSS units or learning sequences
- About their knowledge of the NGSS
- About the relative importance of the district providing professional learning, lesson plans, hands-on materials, and equipment/supplies

A Project Director explained another way that their team carried out needs assessment: "We did a strengths-and-needs assessment with our Core Leadership Team called a SWOT analysis for 'Strengths, Weaknesses, Opportunities, and Threats.' And, we did that at elementary, middle, and high school to see what our areas of strength were at that point in time, what our weaknesses were, and what opportunities we saw as a team."

Two districts administered a Concerns-Based Assessment Model[5] (CBAM; Hall & Hord, 1987) survey to all teachers of science. The CBAM questionnaire is designed to gauge the concerns of respondents relative to a new program. The Core Leadership Teams used the CBAM to determine how ready and willing teachers were to experiment with the new NGSS type of instruction. One district did the CBAM with its Core Leadership Team only. All of the Early Implementer districts included

5 For more information about the CBAM, see http://www.sedl.org/cbam/.

some concerns-based questions in needs assessment surveys taken by teachers participating in the Early Implementers grant. (See Appendix D for information about CBAM's stages of concern.)

A couple of districts administered slightly different surveys to elementary and middle school teachers, and one created separate surveys for grades K–2, 3–5, and 6–8. Most of the districts designed separate surveys for teachers and administrators.

As part of the needs assessment for NGSS implementation, districts conducted districtwide inventories of science equipment and materials. In addition, administrators, parents, business groups, and community organizations were asked what they saw as needs related to science instruction.[6]

With input from all of these sources, the Core Leadership Teams generated a list of resources, procedures, supports, and structures necessary to successfully implement NGSS for all students in their districts. They used this list to inform their vision and their plan for NGSS implementation. The needs assessment process also helped the teams align their NGSS plans with the existing culture, needs, and priorities of the districts. Needs assessment findings were presented in all of the district plans.

Most Project Directors found needs assessment to be one of the most powerful steps in the district planning process (see Table 1). While one Project Director remarked that the needs assessment simply confirmed what they already knew, he added, "But it was sobering to see the raw data, and it did motivate us to target where to improve."

More than one Project Director reported that their district Superintendent was influenced by the reality documented by the survey; said one of these Project Directors: "We used it to support our case when requesting professional development and materials from the district."

Another said that after learning through the NGSS needs assessment that teachers felt they needed training and supplies, the Core Leadership Team advised teachers to give those same answers when completing the district's staff and community LCAP survey: "When the Board received that, and our data echoed theirs, then it was apparent to them that this was important."

Vision and Mission Statements

Vision statements typically consist of one or more future-oriented statements articulating the hopes and aspirations of a team, project, or organization. To develop a shared vision, Core Leadership Teams were invited by the K–12 Alliance to "reach for the stars, dream big, infuse your passion, and envision the destination of the journey (successful implementation of the NGSS in your districts)," while being reminded that "a vision statement is created with appropriate stakeholders and not solely the work of the Core Leadership Team." When asked about the vision and mission statements, one Regional Director emphasized that the most impactful aspect of this component is the team process related to negotiating and building consensus about what to include in the statements, rather than the final wording itself.

A few of the Early Implementer districts' vision statements focused on conditions that would support quality science education for all students, while other districts' vision statements described outcomes and achievements for students. Some were lofty, such as, "To be the model of educational excellence and innovation in the implementation of the California Next Generation Science Standards."

6 Parent surveys were translated into Spanish to maximize response rates in some districts.

Each Core Leadership Team developed a mission statement that described the means to achieve their NGSS vision. One district included in their plan both the district's overall official vision and mission statements (not specific to NGSS implementation) along with the Core Leadership Team's NGSS vision and mission statements. Most teams reviewed their districts' mission and related materials to highlight commonalities when developing their plan for NGSS implementation. (See Appendix E for samples of Vision and Mission Statements.)

Core Values and Operating Principles

Two additional preliminary plan components included in each district's NGSS implementation plan were core values and operating principles. Developing these components required Core Leadership Teams to discuss underlying values and principles they felt were "must haves" in order to achieve the districts' missions. For example, said a Regional Director, "'Science for all' means that we must affirm our commitment to equity in policy and practice." Some Project Directors commented that the articulation of values and principles helped Core Leadership Teams coalesce around a common purpose. As one Project Director noted, many on the team "came in at different places. This helped us come together, to realize what we're working for. It took many hours, but it was useful." (See Appendix F for samples of these NGSS plan components.)

Program Elements Matrix

In January 2015, Core Leadership Team members were introduced to the Program Elements Matrix (PEM) tool, a template used by Core Leadership Teams in developing the PEM component of their NGSS plans.[7] The PEM prompted teams to carefully consider three phases of implementation:

1. Where we are (Awareness) — a realistic assessment of the current circumstances.
2. Rolling along (Transition) — what it will look like when some progress has been made.
3. Reach for the stars (Implementation) — what it will look like when NGSS is fully implemented.

The three phases were not uniformly bound to pre-set time periods. Some activities could be completed relatively quickly, while others could take the full four years of the Initiative, or perhaps longer.

Initiative leaders asked the teams to address the following elements in their PEMs:

- Instruction/teaching
- Professional learning
- Curriculum/resources
- Assessment
- Community/parent engagement
- Policies/practices (including LCAP)
- Equity

As previously shown in Table 1, districts reported that the PEM was one of the most useful components of the district plan. Said a Project Director in 2017, two years after developing the plan, "I have used the PEM to help principals or district administrators understand what this work is all about and how we are planning to move forward." Said another, "The PEM was super essential. It really helped with policy and practices. For instance, the Board policy says students should have three

7 The PEM is a longstanding, widely used structure for implementation plans. For example, it was included in the prior California Science Framework (1990).

years of science, but not what science, so we were able to work on clarifying what that should be." (See Appendix G for sample PEM entries for each element.)

Action Plan

While the PEM sets the course for implementation, it does not include many details. In contrast, the action plan matrix specifies, for each element in the PEM, information such as:

- Events and activities
- Roles and responsibilities
- Outcomes
- Dates and times
- Budget implications

Districts completed action plans with varying degrees of specificity depending on how much information they had at their disposal during the planning process. For some elements (e.g., teacher professional learning), districts could create very detailed plans that included all or most of the information listed in the bullets above for each school year. For other elements, about which limited information was known (e.g., availability of curriculum materials), action plans consisted of a more general "summary of activities."

According to interviews with Project Directors, some Core Leadership Teams referred back to the action plan during NGSS implementation more than others. While most of the Core Leadership Teams looked at their action plans two or three times per year, one Project Director reported looking at it six times per year, during every technical assistance meeting with the Regional Director. Said one Project Director, "It seemed like we looked at it every technical assistance day. It kind of directed us. Everything was attached to it."

Being prompted to budget the actual costs of needed supplies and other support, such as substitutes, proved invaluable when it came to getting financial support from the district: "We looked at our action plan every year when writing the district blueprint, which is what the district uses to determine the allocation of funding. . . . The action plan helped NGSS to be a bigger part of the district's blueprint and to get support from the LCAP. We included things in our plan that weren't necessarily part of the grant, but the team thought they were important, so they used the plan to help make those things happen with the district funds and priorities." (See Appendix H for sample detailed and "summary of activity" action plans.)

When revisiting the action plans, teams employed a variety of strategies when they discovered their implementation was playing out differently than originally specified in the plan. The following are sample reactions by two different Project Directors:

> *I found that the ways we thought we could meet PEM goals didn't always work out, so I went in and modified the action plan. It's been a roadmap to help us decide what to focus on. It's been a living document.*

> *When circumstances change and the plan cannot be carried out as originally intended, the action plan was particularly helpful in making sure things were not dropped without reason. We made a commitment when we wrote the plan. If we are not sticking to it, do we have a good rationale for that?*

Monitoring and Evaluation Plan

A monitoring and evaluation plan was included in each district's NGSS implementation plan, although the level of detail varied. For instance, two district planning teams used a matrix to indicate the evidence they would use each year to evaluate their success relative to each element in the PEM. Three of the districts wrote a description, with varying degrees of specificity, of ways they would collect data to gauge their progress over time. Two evaluation plans stated that outcomes already provided in the action plan would be monitored over time. And two evaluation plans simply committed to reviewing and sharing the NGSS implementation plan with others in the district on a regular basis.

When they were asked about the usefulness of this component of the district plan, most Project Directors reported that their teams had followed their evaluation plans flexibly. They remarked that because unanticipated changes had transpired, it was sometimes difficult to follow all plan activities exactly and this, in turn, required flexibility in evaluating success. One Project Director wondered aloud if writing a plan for six to nine months at a time would allow the team to better tailor evaluation plans to current circumstances.

Most teams reviewed their evaluation plans two or more times per year, usually during technical assistance days with their Regional Director, and typically at the beginning of the school year. Some districts conducted annual surveys of teachers to check on their progress, successes, obstacles, and concerns related to NGSS implementation. The one district that included a check-off column in their action plan as a way to regularly monitor progress reported referring back to their plan the most frequently of all the districts. (See Appendix I for sample monitoring and evaluation plans.)

Challenges

Although Project Directors said that the substantial time and effort expended to produce their district NGSS implementation plan was well worth it, they also reported some challenges.

It Takes Time

The Core Leadership Teams spent a substantial part of every monthly all-day meeting on developing their plans throughout project year one and into year two. The number of hours the teams invested in their NGSS implementation plans was substantial, and their efforts generally paid off, yielding comprehensive plans that reflected many viewpoints and had the support of individuals at multiple levels in the district. One Project Director remarked:

> *I think it just took a lot of time because we wanted to make sure that things were done right. At the beginning, we wanted to really try to understand where we were in that moment so we could address those issues head on and make those incremental steps to move forward. I would just say that I think the hardest part was thinking about all of the different factors and trying to put that on paper.*

Thinking of Everything

Four of the eight Project Directors reported that it was difficult to include everything in the plan and to know what to include when so much about the future was uncertain. One said that, even though they had the benefit of the PEM, the guidance of the K–12 Alliance, and the feedback of their peers, it was very challenging to try to anticipate "all of the different factors and be realistic in our own minds." Another acknowledged that "it was difficult to think about curriculum, because we weren't sure what was coming." One Project Director explained, "The challenging part for us was, as the plan kept evolving, we'd get more things added to what we needed to include, and it became a little bit unwieldy and not as useful. We were thinking pie in the sky."

Changing Realities

A few Project Directors found limitations to their monitoring and evaluation plans. Said one, "We have had to make some adjustments with how to evaluate our work. Things have changed, and sometimes it's hard to get the information we said we would use." From another:

> *When we created the plan, we had no idea that we were going to end up doing so much to involve administrators. When we created the plan, we didn't think about some of the changes that have happened at the district office and the fact that there would be other implementations getting in the way.*

Some parts of the evaluation plan were more useful early in the implementation process, while others were more useful in years three and four:

> *One thing, for instance, is the materials and resources section. We knew that our elementary schools needed a lot in order to really do what we're trying to do. We were able to put money into our LCAP budget for equipment and materials. Then, that phased out over a couple of years. Whereas something like our equity section of the PEM is more of a systemic issue and takes a lot more thought and time to really figure out. — Project Director*

Equity

The K–12 Alliance afforded district teams flexibility either to embed equity in other elements or treat it as a separate element of the PEM. All but one district included a separate equity element in their implementation plans. Some made a point of embedding equity in other elements as well. Two Project Directors mentioned that the equity element was more challenging to write than the others:

> *It forced us to really think about where we were. It is such a large issue that needs attention, and it takes a lot of forms. Like, are ALL students getting science? It can be a matter of what site they are at or what teacher they have. It's more than just breaking down student populations.*

> *Equity was difficult; everyone wants to nod, but no one wants to talk about what it would REALLY mean to do that. And when I say nobody, I don't mean people on the Core Leadership Team, I mean in the larger district, like principals . . . So it was frustrating.*

Recommendations

Project Directors were asked what advice they would give to districts endeavoring to draft their own NGSS implementation plans. Their recommendations are summarized below.

Engage a Wide Range of Stakeholders

The number one recommendation, offered by every Early Implementers Project Director, was to involve stakeholders from all levels in the district, including administrators.[8] Two reasons were given for this strategy. First, the more that stakeholders are involved, the more likely that the plan will be grounded in reality and therefore be achievable, as this Project Director explains:

> *It takes deep thinking, the realization that, "Wow, this has to be multilayered." Not just looking at it from my perspective as a classroom teacher and what I need, but what does somebody in a totally different grade level need? What does the administration need? What do we need to happen behind the scenes as far as getting the community behind us? And that's professional development, looking at our policies and practices. Do we pull students out for the special services during science time? If so, how can we change that? How can we message that and communicate that so that those who work with IEPs [individualized education programs] are involved?*

All Project Directors agreed that teachers who would be impacted by the plan should have a voice. One added, "Involving teachers at multiple grade levels and with different strengths is very important to help the team anticipate and address obstacles so that all teachers will be able to participate."

The other reason given for soliciting input from a range of district staff was to maximize support for the changes and the work related to the plan:

> *My advice would be that you get all vested parties involved in the planning of this, including your district level admin, principals, instructional coaches, and science teachers at all levels. Everyone needs to be involved when you're creating this, because if a few people create it, you don't have buy-in from everybody.*
> *— Project Director*

> *You need to make sure that admin and teachers are in on the plan. I wish I had admin other than just the principals on the Core Leadership Team. Encourage district-level admin as being part of the*

8 See NGSS Early Implementers Initiative evaluation report #3, *Administrators Matter in NGSS Implementation*, to learn about how site and district administrators are making critical contributions to the implementation of the NGSS. Previous evaluation reports can be found here: http://k12alliance.org/ca-ngss.php.

plan. Provide flexibility . . . aim high, but be flexible if things don't go according to plan 100%... Everyone should be involved, including district-level admin all the way to principals, TOSAs, coaches, teachers, etc. to increase buy in. — Project Director

Learning how decisions were made in the district was an important benefit of making connections at all levels in the district. One Project Director recounted:

Working with the plan matrix helped us to realize that we needed to be strategic about inviting parents to the LCAP community feedback meetings. Often, during these meetings, there's time where people talk in small groups, and they have a template or whatever that they fill out together in order to provide feedback. And so we strategically asked people, "If there is someone else there who you know is supportive of science, sit with a different group."

Cultivate an Ally in the District Office

In particular, recruiting an administrator at the district office as a member of the Core Leadership Team was suggested; this was something that most teams did *not* have. A K–12 Alliance Regional Director noted: "You need a voice at the district office, someone who can help prioritize science. In hindsight, all Core Leadership Teams should have had a district-level person on them because they know how to get things done."

A Project Director from one of the larger Early Implementer districts similarly noted, "I think, for us, the missing piece was administrators. In a large district such as ours, there are many centers of power. We had a couple principals and managers and coordinators from the science department but having more of the other sections of the district would have been useful."

Because science typically has taken a backseat to other core subjects in recent years — notably, English language arts and math — the importance of support and messaging from above came through in recommendations:

I would say you need to make sure that the district administration is on the team. Under our last district administration, the principals on our Core Leadership Team were pretty nervous [about what district officials would approve]. So, I would strongly encourage district-level admins being part of the plan. That was the biggest learning from this. — Project Director

Said another Project Director:

There needs to be someone in the district office who's going to have NGSS as one of their top priorities. Decisions get made sometimes in unofficial meetings, or at least the groundwork for decisions gets made there, and you need to have someone who can say, "This could impact whether NGSS will continue to be a priority."

Gather Data

Through the needs assessment, Core Leadership Teams learned what teachers across the district felt they needed, and this guided how they prioritized activities for implementing NGSS. As mentioned above, district teams learned the power of data when they were able to share survey results with district office personnel and Superintendents to help make the case for supporting science. Collecting data in the first year enabled districts to track their progress, which was instrumental in soliciting resources for supplies, release time, and other support for NGSS.

As one Project Director said, "Gather data for sure; know where you are starting! Be as specific as you can — dates, times, who is doing what. Know who the DRI — directly responsible individual — is and who is paying for it."

Do What Works

Project Directors and Regional Directors alike advocated for tailoring the plan to the context of the district. They noted that the components and process used by the Early Implementers is not necessarily the best way for all districts to plan implementation of the NGSS:

> *[Other districts] should consider the context of their district. Look at what was learned from their implementation of Common Core, what rules were imposed and how that went. And they should ask for help. They can learn from districts that have done this before. Read reports about the Early Implementer districts or reports from Achieve, to find out what things you need to consider when you're thinking about NGSS. There are resources out there. They also need a planning process that works for their district. Don't jump into doing a PEM if you don't have someone that is trained to do that. As long as you come out with a plan that's thoughtful, that spans a period of time, that really addresses the elements that you need to think about doing. There isn't only one way to plan this out. — Regional Director*

Share the Plan Widely

Related to the recommendation that the planning process involve a range of stakeholders, Project Directors also talked about the importance of sharing the plan once it is written: "It helps to structure the conversation with other district office people. Everybody has questions. Everyone wants their feedback to be taken into account. Creating a plan that you can share and get feedback from makes it transparent."

A Project Director of a larger district recounted this experience:

> *I talked to one of the other administrators, whose office is not far from mine, and she thought that the whole purpose of our grant was to develop assessments. So, I think you need to be very clear with people, meaning not only teachers and principals, but central office personnel need to be a part of the development of the plan, so that everybody knows about it, has ownership of it, and is supportive.*

Go Slow to Go Fast

This theme from Early Implementers teacher trainings in the Initiative's first year was echoed in conversations with Project Directors about the district plan. Since NGSS requires multiple and significant instructional changes, teachers need time to experiment. Here is one Project Director's recommendation:

> *Start with a core group of teachers or a variety of people who can really think it through. In our first year, we said to teachers on our Core Leadership Team, "Go out and try everything you can. Make as many mistakes as you think possibly could be made so we can really prepare for the following year when we involve more teachers." I'd suggest a district new to NGSS do that.*

The Project Director in one of the larger Early Implementer districts echoed this view: "At the monthly county office science leadership network meetings, we have heard that some districts are struggling with backlash from teachers who are saying, 'You want me to change everything this year?!' So, I think having the three-year plan has been really good."

Maintain a Living Document

The following comments by three Project Directors illustrate the importance of actively maintaining and adapting the plan after it has been developed:

> *The plan has to be a living document. It can't be like when some people do a vision or mission statement. They spend a week doing that with their staff and then it sits there. It needs to be something that really guides you.*

> *Keep track of how you deviate from the original and make new goals as you progress that reflect changing circumstances.*

> *Consult it regularly, but don't feel bound to follow it — things change.*

Keep in Mind the Larger Purpose

One Project Director emphasized constantly remembering the purpose behind the planning work:

> *Just remember, this is good for the students. This is good teaching for students. This is preparing them for the future. The effort that it takes to make science happen in a classroom is really going to make a difference in the type of thinking that we have in our citizens of the future and the decisions that they will make that will impact our society, impact the Earth. So that big picture helps you sometimes keep the energy when you're feeling frustrated because something didn't quite go the way you were anticipating it would.*

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District Plan Appendices

Please note that in order to limit the size of this report, we have only included select examples of the components from districts' NGSS implementation plans in these appendices. For most components, more samples can be obtained by emailing Kimberly Nguyen (knguyen2@wested.org).

Appendix A. Related Resources

This appendix briefly describes three reports from sources outside the NGSS Early Implementers Initiative that also are strongly relevant for any district implementing the NGSS. These reports have information that is complementary to this current report (#4) by the evaluation team for the NGSS Early Implementers.

Guide to District Action: Next Generation Science Standards (Science Partnership, n.d.). Retrieved from https://www.acoe.org/cms/lib/CA02209553/Centricity/Domain/43/Guide%20to%20District%20Action%20for%20NGSS.pdf

This 14-page guide provides two ready-to-use components: an Implementation Planning Tool and a District Action Plan Template, both of which focus on six key areas:

4. Implementation planning and systemic support
5. Financial and material resources
6. Professional learning plan
7. Student experience and classroom culture
8. Partnerships with family, community, and other stakeholders
9. Data and assessments

For each of the six key areas, the Implementation Planning Tool provides a one-page table showing possible activities to undertake during each of three phases of implementation: awareness, transition, and full implementation. Following an introductory discussion of the NGSS and the district action design process are blank District Action Templates for each key area, which districts can use to fill in the particulars for their local implementation.

One of the authors, Phil LaFontaine, is a Regional Director for WestEd's K–12 Alliance in the NGSS Early Implementers Initiative.

Next Generation Science Standards District Implementation Workbook (Achieve, 2017). Retrieved from https://www.nextgenscience.org/news/ngss-district-implementation-workbook

Like the Science Partnership document, this 55-page document by Achieve also is a "how to" guide, only in even greater detail. The workbook builds on the National Research Council's *Guide to Implementing the Next Generation Science Standards* (2015, 114 pages) and focuses on four core areas: (1) educator support, (2) informed stakeholders, (3) high-quality instructional materials, and (4) an effective assessment.

California is taking robust, specific next steps on assessment during the 2018–19 school year that hopefully will be aligned with the recommendations that Achieve offers in this workbook; however, given this state action, district leaders in California may not be in a position to take strong advantage of the workbook's advice in the core area of effective assessment.

Framework for Leading Next Generation Science Standards Implementation (Stiles, Mundry, & DiRanna, 2017). Retrieved from https://www.wested.org/wp-content/uploads/2017/10/Framework-for-Leading-NGSS-Implementation.pdf

This 50-page framework focuses on four Domains: (1) leadership knowledge, (2) critical actions, (3) impacting NGSS teaching and learning, and (4) sustaining implementation of NGSS. The framework provides detailed and specific advice, including recurring "leadership reflection questions" that facilitators can use to prompt needed thinking and discussions. The document elaborates in greater detail many of the principals discussed in this current NGSS Early Implementers Initiative evaluation report. As a framework (rather than a guide or workbook, like the two previous resources described above), this document does not provide specific templates for developing action plans.

Authors of this framework include Kathy DiRanna, Director of WestEd's K–12 Alliance, which is supporting districts in the NGSS Early Implementers Initiative. The report, funded by the Carnegie Corporation of New York, was based on both expert wisdom and a literature review; the report provides seven pages of citations of references and resources.

Appendix B. Norms for Collaborative Work

Establishing and adhering to group norms supports behaviors on the part of team members that facilitate constructive and productive group work. The K–12 Alliance uses the following norms for collaborative work (the 7 *Ps*) to foster cooperation and team building within the Early Implementers Core Leadership Teams:

- **Paraphrasing**. Paraphrasing is one of the most valuable and least used communication tools in meetings. A paraphrase can be used effectively with a question. First paraphrase, then ask a question. Practice this skill and notice what happens to the dynamics of the conversation. Paraphrasing aligns the parties and creates a safe environment for thinking. Levels of paraphrase may include any of the following: clarify speaker statement, summarize hearing what was said, or shifting what was said to include overarching purpose.

- **Pausing**. Pausing is based on "wait time" research indicating higher-level thinking takes 3 to 5 seconds and the time changes quality of thinking. Four kinds of pausing allow this processing. The first is after a question is asked. The second is after someone speaks. A third type is under the control of the speaker ("Give me a moment and I will answer"). The fourth type of pause is a collective pause formally structured by the group. Some pauses are decided by the group and some initiated individually.

- **Probing for specificity**. Human brains are not designed for specificity. Brains form quick generalizations from fragments of information. These quick judgments based on assumptions can cause difficulties in communication. Five areas contributing to overuse of generalizations are vague nouns and pronouns, vague action words, comparators, rule words, and universal quantifiers. Probing action asks members to remove the generalization and find the exact data.

- **Putting ideas on the table**. Ideas are the heart of group work. In order to be effective, they must be released to the group ("Here is an idea for consideration" or "I am putting this idea on the table"). It is equally important to know when to remove an idea from the table. Use signal words such as "I think this idea is blocking our thinking and I want to remove it from the table."

- **Paying attention to self and others**. Meaningful dialogue and discussion is facilitated when each group member is conscious of oneself and others. This consciousness includes being aware of your own and others posture, gesture, and other non-verbals. Paying attention to self and others could include amount of talking, amount of silence, or responding to others' learning style.

- **Posing questions**. The balance of advocacy and inquiry requires both emotional and cognitive resources. The balance is most necessary at the exact point when many group members are least likely to want to inquiry into the ideas of others. It is at the moment of greatest disagreement that this norm makes the biggest difference.

- **Presuming positive intent**. Assuming that others' intentions are positive encourages honest conversations about important matters. Positive presuppositions reduce the possibility of the listener perceiving threats and challenges in a paraphrase or question. Group members can signal "presuming positive intent" by saying, "I think _____."

Source: The Adaptive School: A Sourcebook for Developing Collaborative Groups (Garmston & Wellman, 1999).

Appendix C. Sample Needs Assessments

Needs Assessment Sample 1

This sample includes a needs assessment questionnaire used by one Early Implementer district to collect data from elementary teachers. Questions were developed/adapted from several sources including NGSS Early Implementers Expectations; Core Leadership Team (CLT) input during Year 1 Technical Assistance Days; and two WestEd reports — *High Hopes–Few Opportunities: The Status of Elementary Science Education in California,*[9] and *Untapped Potential: The Status of Middle School Science Education in California.*[10]

A draft needs assessment questionnaire was reviewed by the district's CLT during the May 2015 Technical Assistance Day, and adjustments/edits were made to finalize the survey. Some of the adjustments included separating the K–5 and 6–8 surveys, removing items deemed to be redundant, and streamlining the format to keep survey completion time under 30 minutes.

The final survey consisted of 8 major sections:

- Curriculum
- Instruction
- Challenges
- Program Support
- Assessment
- Policies/Procedures/Practice
- Community
- Science Professional Learning

The survey was given via a Google Form during a site staff meeting between September 15 and October 1, with the administration being overseen by a CLT member or the Project Director. Incentives were provided to teachers in the form of a raffle.

9 Dorph, R., Shields, P. M., Tiffany-Morales, J., Hartry, A., & McCaffrey, T. (2011). *High hopes—few opportunities: The status of elementary science education in California. Strengthening science education in California.* Sacramento, CA: Center for the Future of Teaching and Learning at WestEd.

10 Hartry, A., Dorph, R., Shields, P. M., Tiffany-Morales, J., & Romero, V. (2012). *Untapped potential: The status of middle school science education in California.* Sacramento, CA: The Center for the Future of Teaching and Learning at WestEd.

Questionnaire

NGSS-Elementary Science Program Status

* Required

Curriculum

This section contains questions regarding science instructional materials

1. **Do you have 1:1 iPads in your classroom?**
   Mark only one oval.
   - ◯ Yes
   - ◯ No

2. **Instructional Materials usage:**
   Please indicate which current instructional materials are regularly utilized during science instruction in your classroom
   Mark only one oval per row.

	Regular Use	Intermittently Use	Rarely use	Never Use
Discovery Works Text (Houghton-Mifflin)	◯	◯	◯	◯
Science California (Houghton-Mifflin)	◯	◯	◯	◯
Inquiry Based Science Kits (FOSS, Carolina, STC, etc.)	◯	◯	◯	◯
Ciencias (Scott-Foresman/Pearson)	◯	◯	◯	◯
Open Source Material (online, etc.)	◯	◯	◯	◯
Teacher Created Material	◯	◯	◯	◯
Older Science Adoptions	◯	◯	◯	◯

3. **Other**
   Please list any websites or apps that you regularly use for science instruction

Instruction

This section contains questions regarding Science Instruction and Pedagogy.

4. **Science and Social Studies**
   Mark only one oval.
   - ◯ I alternate between science and social studies during the school year. *Skip to question 5.*
   - ◯ I teach both science and social studies year round *Skip to question 7.*

Science Social Studies Follow Up--alternating

5. **How often do you alternate between science and social studies units of study?**
   please estimate based upon a typical year.
   Mark only one oval.

- ◯ Weekly
- ◯ 2-4 weeks
- ◯ 5-6 weeks
- ◯ 7-8 weeks
- ◯ 9-10 weeks
- ◯ 11-12 weeks
- ◯ Other: _____

6. **Science Instruction During the Week**
   When teaching science, what best describes the frequency of science instruction in your classroom?
   Mark only one oval.

- ◯ 1 Day/Week
- ◯ 2 Days/Week
- ◯ 3 Days Week
- ◯ 4 Days Week
- ◯ Every Day

Skip to question 8.

Science and Social Studies Follow Up-Both All Year

7. **Science Instruction During the Week**
   When teaching science, what best describes the frequency of science instruction in your classroom?
   Mark only one oval.

- ◯ 1 Day/Week
- ◯ 2 Days/Week
- ◯ 3 Days Week
- ◯ 4 Days Week
- ◯ Every Day

Skip to question 8.

Minutes per week

8. **Time spent on science instruction per week** *

On average, how many minutes of science instruction do your students receive each week.
Mark only one oval per row.

	0-30 minutes	31-60 minutes	61-90 minutes	91-120 minutes	121-150 minutes	151-180 minutes	180+ minutes
Minutes per Week	◯	◯	◯	◯	◯	◯	◯

Frequency of use-Pedagogy

9. **Frequency of use of instructional practices in the science classroom**

In your estimation, how often do your students engage in the following practices during science.
Mark only one oval per row.

	Always	Frequently	Sometimes	Rarely	Never	Unsure
Ask Questions and Define Problems	◯	◯	◯	◯	◯	◯
Develop and Use Models	◯	◯	◯	◯	◯	◯
Plan and Carry Out Investigations	◯	◯	◯	◯	◯	◯
Analyze and Interpret Data	◯	◯	◯	◯	◯	◯
Use Math and Computational Thinking	◯	◯	◯	◯	◯	◯
Construct Explanations and Design Solutions	◯	◯	◯	◯	◯	◯
Engage in Argument from Evidence	◯	◯	◯	◯	◯	◯
Obtain, Evaluate, and Communicate Information	◯	◯	◯	◯	◯	◯
Read textbook	◯	◯	◯	◯	◯	◯
Take notes and listen	◯	◯	◯	◯	◯	◯
Use a sense-making notebook	◯	◯	◯	◯	◯	◯
Answer textbook or worksheet questions	◯	◯	◯	◯	◯	◯
Use technology to understand science	◯	◯	◯	◯	◯	◯
Watch demonstrations or video presentations	◯	◯	◯	◯	◯	◯
Collaborate in groups	◯	◯	◯	◯	◯	◯
Do hands on activities	◯	◯	◯	◯	◯	◯
Read non-textbook materials	◯	◯	◯	◯	◯	◯
Discussions/Oral Language Development	◯	◯	◯	◯	◯	◯

10. **Science Notebooks**

Do you utilize science notebooks regularly during science instruction?
Mark only one oval.

◯ Yes *Skip to question 11.*

◯ No *Skip to question 13.*

Science Notebook Follow Up Questions

11. **In your estimation, to what degree are the science notebooks Teacher Driven (notes, vocabulary., organizational tool) compared to Student Driven (sense-making, metacognitive, etc.)?**
Please do your best to place your use of student notebooks appropriately on the scale below
Mark only one oval.

	1	2	3	4	5	6	7	8	9	10	
Teacher Driven	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	Student Driven

12. **What is included in your student's science notebook?**
Check all that apply
Check all that apply.

- [ ] Student Prior Knowledge
- [ ] Definitions and Notes
- [ ] Data Collection
- [ ] Student Generated Analytical Thinking
- [ ] Metacognition
- [ ] Opportunities to Revise Thinking
- [ ] Procedures/Directions
- [ ] Scientific Drawings

Notebook Professional Learning Interests

13. **Which science notebook professional learning opportunities would you be interested in?**
Check all that apply
Check all that apply.

- [ ] Rationale: Why Use Sense-making Notebooks?
- [ ] Linking science & ELA/Math Common Core State Standards
- [ ] Practices: Learning Science Through the Science and Engineering Practices
- [ ] Use of Electronic/Digital Notebooks

14. **Other Desired Professional Learning Opportunities Related to Science Notebooks**
Optional

Challenges

Please indicate below the degree to which each row presents a challenge for you in your Science classroom

15. **To what degree do each of the areas below present a challenge for science teaching and learning in your classroom**
Mark only one oval per row.

	Not a challenge	Mild Challenge	Moderate Challenge	Major Challenge
Student Interest	◯	◯	◯	◯
Parent Support	◯	◯	◯	◯
Classroom Management	◯	◯	◯	◯
Logistics/ Block Scheduling/Rotations	◯	◯	◯	◯
Facilities/Equipment	◯	◯	◯	◯
Science Kit Refurbishment	◯	◯	◯	◯
Science Specific Professional Learning Opportunties	◯	◯	◯	◯
Funds for Equipment and Supplies	◯	◯	◯	◯
Class size	◯	◯	◯	◯
Emphasis on ELA and Math	◯	◯	◯	◯
Time for Science Education	◯	◯	◯	◯
Teacher Confidence with Science Content	◯	◯	◯	◯
Technology Function and Support	◯	◯	◯	◯
Language Appropriate Text (EL or Immersion)	◯	◯	◯	◯
Time for Collaboration with Colleagues	◯	◯	◯	◯

Program Support

Science Program Support

16. **Teacher Preparation/Comfort with Science Content**
How prepared do you feel to teach science effectively at your grade level?
Mark only one oval per row.

	Not Prepared	Somewhat Prepared	Prepared	Very Prepared
Engineering	◯	◯	◯	◯
Life Science	◯	◯	◯	◯
Earth Science	◯	◯	◯	◯
Physical Science	◯	◯	◯	◯

17. **Teacher Preparation/Comfort with Science Instructional Practices**

How comfortable/prepared do you feel with regard to the science instructional practices below?
Mark only one oval per row.

	Not Prepared	Somewhat Prepared	Prepared	Very Prepared
Integrating science content to support CCSS ELA proficiency	◯	◯	◯	◯
Integrating science content to support CCSS Math proficiency	◯	◯	◯	◯
Teaching Science to a class that includes students that are Language Learners	◯	◯	◯	◯
Teaching science to a class that includes students with special needs	◯	◯	◯	◯
Using inquiry/investigation oriented teaching strategies	◯	◯	◯	◯
Using Kit-based Science Curriculum	◯	◯	◯	◯
Using assessment for teaching and learning	◯	◯	◯	◯
Using formative assessment(s) to adjust science instruction	◯	◯	◯	◯
Aligning current instructional materials to California NGSS Standards	◯	◯	◯	◯
Integrating technology into science instruction	◯	◯	◯	◯
Integrating Engineering into science instruction	◯	◯	◯	◯
Implementing NGSS required 3-D instruction	◯	◯	◯	◯

Assessment

18. **Formative Assessment Practices/Frequencies**

When teaching science, how often would you estimate that you engage in the following assessment practices related to science instruction in your classroom

Mark only one oval per row.

	0 times/week	1 time/week	2 times/week	3-4 times/week	daily
Plan assessment before instruction	◯	◯	◯	◯	◯
Analyze student work in science notebooks	◯	◯	◯	◯	◯
Analyze student work in response sheets outside of a notebook	◯	◯	◯	◯	◯
Analyze student observations	◯	◯	◯	◯	◯
Analyze student-to-student discourse	◯	◯	◯	◯	◯
Provide feedback to individual students based on an analysis of student work	◯	◯	◯	◯	◯
Provide feedback to entire class based on analysis of student work	◯	◯	◯	◯	◯
Reteach content/adjust instruction to whole class based on analysis and interpretation of student work	◯	◯	◯	◯	◯
Adjust instruction/provide additional instruction to individual or small groups of students based on analysis and interpretation of student work	◯	◯	◯	◯	◯
Use technology to construct and administer assessment item(s)	◯	◯	◯	◯	◯
Use technology to provide teacher-to-student, or student-to-student feedback	◯	◯	◯	◯	◯

19. **Other Assessment Practices Not Addressed Above**

Optional

_____

20. **How often do you utilize the types of SUMMATIVE assessments below during your science instruction?**

Mark all that apply

Mark only one oval per row.

	Never	Weekly	Mid-unit	End of unit	Throughout unit and end of unit
Instructional Materials Provided Summative Assessments	◯	◯	◯	◯	◯
Multiple Choice Quizzes/Tests	◯	◯	◯	◯	◯
Vocabulary Quiz/Tests	◯	◯	◯	◯	◯
Short Answer Quiz/Test	◯	◯	◯	◯	◯
Performance Tasks	◯	◯	◯	◯	◯
Culminating Project	◯	◯	◯	◯	◯

21. **To what extent do you use the following as a source for summative assessment items?**
Mark all that apply
Mark only one oval per row.

	0% of the time	25% of the time	50% of the time	75% of the time	100% of the time
Instructional Materials					
Teacher modified from instructional materials					
Teacher created					
Digital test bank					

22. **Other Sources For Assessment Items**
Optional

Policies/Procedures/Practice

This section contains questions related to policies, procedures, and current practices regarding the science program.

Policies Procedures Page

23. **Are students regularly pulled out of your science instructional time?**
Mark only one oval.

- Yes *Skip to question 24.*
- No *Skip to question 26.*

Pulled out-Yes

24. **How often are students regularly scheduled to be out of your class during science instruction for the purposes below?**
Mark only one oval per row.

	Never	Rarely	Sometimes	Often	Always
Speech					
Resource Specialist Instruction (RSP)					
Language Development (ELD) Instruction/Enrichment					
Universal Access/Additional ELA/Math Instruction					
Counseling					
GATE Pullout					
Enrichment (eg, band, music, art, safety patrol, 7 habits, ASB)					

25. **In your opinion, to what degree does site scheduling/mandates, current practice impact quality science instruction for every student?**
Mark only one oval per row.

	No impact	Some impact	Moderate	Hight Impact
	◯	◯	◯	◯

Scheduling Mandates

26. **To your knowledge are there required (mandatory, implied, or just current practice) minutes for ELA/Math Instruction?**
Mark only one oval.

- ◯ Yes *Skip to question 27.*
- ◯ No
- ◯ Not Sure *Skip to question 27.*

Mandatory Minutes Page

27. **Estimate the length in minutes of "required", or implied protocol for ELA instruction at your site/grade level. (eg. 60, 90, etc.)**
Answer must be a number

28. **Estimate the length in minutes of "required", or implied protocol for Math instruction at your site/grade level. (eg. 60, 90, etc.)**
Answer must be a number

29. **In your opinion, do the required/expected ELA/Math minutes allow you sufficient time to teach science?**
Mark only one oval.

- ◯ Yes
- ◯ No

30. **Would you recommend adjustments to the required ELA/Math minutes to allow more time for science instruction?**
Mark only one oval.

- ◯ Yes
- ◯ No

Community

31. **How would you rate the community's involvement with your classroom in science and engineering?**
Mark only one oval per row.

	Not involved	Somewhat involved	Involved	Very Involved
Parents	◯	◯	◯	◯
Local STEM Businesses/Industry Professionals	◯	◯	◯	◯
Local Community Organizations (Stadium Association, Barona Band of Native Americans, Kiwanis, Rotary, etc.)	◯	◯	◯	◯
High School Matriculation/Vertical Alignment	◯	◯	◯	◯
Site PTA	◯	◯	◯	◯

32. **Community Resources: What Community-Based Science and Engineering Resources have you utilized to support science instruction?**
Please check all that apply
Check all that apply.

- ☐ Parents
- ☐ Local STEM-related organizations
- ☐ Science Experts/STEM Professionals
- ☐ High School Teachers/Programs
- ☐ Institutes of Higher Learning (Community Colleges, Universities)
- ☐ Informal Science Learning Institutions (Museums, Science Centers, Zoos)
- ☐ San Diego Science Alliance
- ☐ Site PTA
- ☐ Other

Science Support from External Organizations

33. **In the last 2 years, have you received FUNDING/FISCAL SUPPORT from any of the below external organizations**
Check all that apply.

- ☐ Local Business Organizations
- ☐ Local Community Organizations (Stadium Association, Kiwanis, Rotary, etc.)
- ☐ Local Individual Business
- ☐ Federal Funding Agencies (NASA,NSF, Dept. of Ed.)
- ☐ Institutes of Higher Education (colleges, universities)
- ☐ Informal Learning Institutions (Museums, Science Centers, Zoos, etc.)
- ☐ San Diego County Office of Education
- ☐ Money from your own pocket

34. **In the last 2 years, have you received support in the form of INSTRUCTIONAL MATERIALS from any of the below external organizations**
Check all that apply.

- [ ] Local Business Organizations
- [ ] Local Community Organizations (Stadium Association, Kiwanis, Rotary, etc.)
- [ ] Local Individual Business
- [ ] Federal Funding Agencies (NASA,NSF, Dept. of Ed.)
- [ ] Institutes of Higher Education (colleges, universities)
- [ ] Informal Learning Institutions (Museums, Science Centers, Zoos, etc.)
- [ ] San Diego County Office of Education
- [ ] Money from your own pocket

35. **In the last 2 years, have you received support in the form of PROFESSIONAL LEARNING from any of the below external organizations**
Check all that apply.

- [ ] Local Business Organizations
- [ ] Local Community Organizations (Stadium Association, Kiwanis, Rotary, etc.)
- [ ] Local Individual Business
- [ ] Federal Funding Agencies (NASA,NSF, Dept. of Ed.)
- [ ] Institutes of Higher Education (colleges, universities)
- [ ] Informal Learning Institutions (Museums, Science Centers, Zoos, etc.)
- [ ] San Diego County Office of Education
- [ ] Money from your own pocket

Science Professional Learning

36. **Professional Learning Placement**

How likely are you to attend science professional development sessions if they were made available?
Mark only one oval per row.

	Will Not Attend	May Attend	Likely to Attend	Definitely Attend
Tiered After School Professional Learning Series (eg. Science Notebooks 101, 102, Science and Engineering Practices 101, 102, etc.)	⬭	⬭	⬭	⬭
Archived On Line Professional Learning Series (content, pedagogy, etc.)	⬭	⬭	⬭	⬭
Live Online Professional Learning Series (content, pedagogy, etc.)	⬭	⬭	⬭	⬭
Summer programs	⬭	⬭	⬭	⬭
Tiered After school Professional Learning Standalone Sessions	⬭	⬭	⬭	⬭
Saturday Sessions 4 hours or less	⬭	⬭	⬭	⬭
Saturday Sessions more than 4 hours	⬭	⬭	⬭	⬭

37. **Which of the following options would encourage you to participate in attending science professional learning?**

Select your top 3 choices
Check all that apply.

- ☐ Science supplies for your classroom
- ☐ University Course Credits
- ☐ Small group size
- ☐ Student Field Trip
- ☐ District Recognition
- ☐ Hourly Rate
- ☐ Entry into a raffle

Summary of Results

The following list summarizes some key data from the needs assessment questionnaire above that was used to inform the following elements of the PEM and the action plan: curriculum, instruction, assessment, professional learning, community, and policies/procedure/equity.

- 58% of K–5 respondents alternate between teaching social studies and science
- 73% of K–5 respondents report teaching <90 minutes per week of science when teaching science
  - 45% of those respondents report teaching <60 minutes per week of science when teaching science
  - 61% of K–5 respondents report using science notebooks during instruction
  - 72% of those respondents report that their science notebooks are primarily teacher driven
  - 59% and 57% respectively would welcome professional learning around science notebooks linking science and NGSS to Common Core ELA/Math, and learning science through the NGSS Science and Engineering Practices
- Major challenges to high-quality science teaching and learning cited by respondents included:
  - Facilities/equipment (74%)
  - Funds for supplies (85%)
  - Science kit refurbishment (83%)
  - Time for collaboration with colleagues (69%)
  - Time for science education (58%)
- Teacher preparedness for NGSS instructional shifts
  - Aligning current instructional materials to NGSS: 79% "somewhat prepared" or "not prepared"
  - Integrating science instruction to support CCSS ELA: 75% "somewhat prepared" or "not prepared"
  - Integrating science instruction to support CCSS Math: 84% "somewhat prepared" or "not prepared"
  - Integrating engineering into science instruction: 87% "somewhat prepared" or "not prepared"
  - Implementing NGSS required 3-D instruction: 89% "somewhat prepared" or "not prepared"

Appendix D. Concerns-Based Assessment Model: Stages of Concern

Two districts administered Concerns-Based Assessment Model (CBAM; Hall & Hord, 1987) surveys to all teachers of science to gauge how ready and willing teachers were to experiment with the new type of instruction called for by the NGSS. One district did the CBAM with its Core Leadership Team only. All of the districts included some concerns-based questions in needs-assessment surveys taken by teachers participating in the Early Implementers grant.

Stage of Concern	Typical Statement
0: Unconcerned	"I think I heard something about it, but I'm too busy right now with other priorities to be concerned about it."
1: Informational	"This seems interesting, and I would like to know more about it."
2: Personal	"I'm concerned about the changes I'll need to make in my routines."
3: Management	"I'm concerned about how much time it takes to get ready to teach with this new approach."
4: Consequence	"How will this new approach affect my students?"
5: Collaboration	"I'm looking forward to sharing some ideas about it with other teachers."
6: Refocusing	"I have some ideas about something that would work even better."

Appendix E. Sample Vision and Mission Statements

The following are samples of vision statements and mission statements developed by the Early Implementer districts.

Vision/Mission Statements Sample 1

Vision Statement: The Next Generation Science Standards will become an integral component of the district's broad spectrum of educational programs. We are committed to providing integrated and connected NGSS instruction focused on equity which will encourage curiosity, academic risk-taking, and enable all students to achieve their highest potential.

Mission Statement: The district's mission is to implement the California Next Generation Science Standards to provide high-quality science instruction to all students so they may attain their highest potential in order to participate in the society of tomorrow.

Vision/Mission Statements Sample 2

Vision Statement: To create a learning community of teachers that work to implement, teach, and enrich student knowledge through authentic science experiences based on the NGSS, ensuring that students become flexible problem solvers and innovative thinkers.

Mission Statement: To engage ALL learners in ALL schools in ALL classrooms in innovative and meaningful three-dimensional Next Generation science experiences.

Vision/Mission Statements Sample 3

District's Vision Statement: All students in the district will become lifelong learners, responsible citizens, and leaders in the 21st century.

Early Implementers Initiative 's Vision Statement: All students upon graduation will have a strong foundation in science and engineering for their college, career, and civic competence in a democratic society. Teachers will use a standards-based, teacher-made, district scope and sequence to deliver vertically aligned instruction from grades TK–12, including common grade-level investigations. In addition, all teachers of science will use a Next Generation Science Standards-aligned districtwide common formative assessment system to support their work to align instructional practices with students' needs for learning. Students will think and work like scientists, immersed in the disciplinary core ideas of science.

District's Mission Statement: The district prepares our diverse student population to be college and career ready in the 21st century by providing a quality learning environment in safe, modern facilities equipped with the latest technological tools. Our world class, culturally proficient staff empowers students to reach their

fullest potential and prepares students to solve real-world problems by utilizing best instructional practices and collaborating with the community, businesses, and institutions of higher learning. All efforts in the district, including this NGSS Early Implementers Initiative, must align with one or more of the district's Strategic Goals:

> **Goal 1:** Prepare all students to be well-rounded individuals with the knowledge and skills to pursue college and/or their careers.
>
> **Goal 2:** Hire, support, develop, train, and sustain district employees who create a singleness of purpose focused on maximizing students' academic, social, and emotional potential.
>
> **Goal 3:** Apply fiscal, operational, and community resources to ensure a safe learning environment that supports staff and student goals.

Early Implementers Initiative 's Mission Statement: The district provides professional development in both science content and pedagogy, supports the development and implementation of districtwide curriculum maps and adopted materials for investigations, and supports teachers in creating and using the Next Generation Science Standards-aligned, teacher-made, district common formative assessment system to ensure equity of experience in implementing the NGSS so that all the standards are taught to all students, science is taught as a core subject K–8, and grades 6–8 teach the integrated science model.

Vision/Mission Statements Sample 4

Vision Statement: All students will graduate science literate with the skills that they need to succeed in college, career, and community.

Mission Statement: Shift from current K–12 science standards, instruction and assessment to the NGSS in all classrooms over the next 2–3 years by:

- Modeling NGSS practices in professional development.
- Building site capacity and leadership.
- Partnering with Teaching and Learning, CCRO, TDO, and outside organizations.
- Supporting the growth and learning of individual teachers.
- Developing a shared vision and goals across the district science community.
- Functioning as a high-quality, consistent, professional, and supportive team.

NGSS classrooms will teach collaboration, discourse, and critical-thinking skills to all students in district, allowing them to achieve excellence and success regardless of school site, neighborhood, race, class, gender, first language, or learning abilities.

Appendix F. Sample Core Values and Operating Principles

As they worked together to plan NGSS implementation for their districts, teams were instructed to clarify for themselves and explicitly share in their plans the underlying core values and principles on which they intend to operate when leading the implementation of the new standards in their districts. These would identify "must haves" in order to succeed. For example, said a Regional Director, "'Science for all' means that we must affirm our commitment to equity in policy and practice."

Core Values/Operating Principles Sample 1

Core Values

- The Next Generation Science Standards establish the vision for learning science and engineering for all students.
- Science is taught daily as a core subject and integrated with other subjects.
- All stakeholders (students, parents/caregivers, educators, and community members) support equitable opportunities for all students to learn science.

Operating Principles

- **Culture:** Develop a growth mindset to celebrate success, encourage risk-taking, support inquiry, challenge assumptions, and learn from mistakes.
- **Support:** Focus on a positive outlook to find solutions, believe in all students, and use available resources.
- **Collaborate:** Teacher leaders collaborate with one another and with community stakeholders and district personnel to support the shifts in instruction outlined by the CA Next Generation Science Standards.
- **Practice:** Hold ourselves accountable to acknowledge and address challenges clearly.
- **Reflection:** Ask questions about what works and doesn't work, gather and interpret data to answer those questions, and design evidence-based instructions to meet the needs of all students.

Core Values/Operating Principles Sample 2

Core Values

- Focusing on Equity, Excellence, Engagement, and Innovation for each learner.
- Inspiring learners through phenomena-based real science experiences doing what scientists do and thinking how scientists think.

- Elevating science and engineering as key pathways for every learner to prepare for 21st century innovation amidst challenges.
- Creating an environment of shared responsibility supporting continuous improvement through reflection and personalized journeys.
- Building collaborative inquiring communities of learners within and between students, teachers, parents, administrators, and all learners.
- Personalizing learning and sense-making.

Operating Principles

- ALL learners will experience equitable quality science instruction as core content instruction, including English learners, special needs learners, GATE and divergent thinkers, and at-risk, struggling, or socioeconomically challenged learners.
- Policies, practices, and resources will support quality learning experiences in science and engineering in which students ask questions of phenomena, solve real world problems, and utilize technology in the learning and sharing process while preparing for 21st century challenges and applications.
- Learner-centered teaching practices will promote personalized sense-making.
- Monitoring, evaluating, and reflection of data will guide improvements in science education using the NGSS in each classroom.

Core Values/Operating Principles Sample 5

Core Values

For all students to be science literate, the Science Dept. must provide opportunities for students to learn so that differences in achievement due to inequities across schools can be eradicated. Instruction must be inclusive and engaging for a diverse student population. Equity in science education through equitable resource allocation should support the same level of consistently high-quality science instruction in every classroom.

We believe that all students are capable of enjoying, engaging in, and learning science. Science learning is student-focused, with emphases on learning science content, evidence-based sense-making, communication through discipline-specific language use, and engagement in science and engineering practices. A balanced focus on both practices and content aims to ready students for college, career, and community. In the science classroom, teachers must recognize each student's prior knowledge and experience, their cultural knowledge and language variance as valuable assets. Students engage in culturally and community-relevant learning experiences with real-world connections. Furthermore, students participate in authentic collaborative science work, including field work, where their innate curiosity about the natural world can be nurtured, their reasoning and problem-solving skills honed, and their ability to ask and answer their own questions developed. Through multidisciplinary learning modes, students develop the ability to see and make connections, and apply their science knowledge to affect the world around them.

Central to science learning and teaching is its interconnectedness to language, literacy, and all subject areas. Student work must show evidence of integrated reading, writing, and math embedded in content-rich science. Development of depth in science knowledge through the reading of a wide variety of complex text, expert interviews, and science field trips are valued as part of the science program. Furthermore, speaking in the form of highly effectively Group and Science Talk is also

central to sense-making, arguing with evidence, constructing explanation, and academic language development. We strive to encourage all voices to be heard so all students can participate in meaningful science conversations.

At the elementary level, science learning and teaching should begin as early as TK and continued consistently throughout K–12 with advocacy and leadership taking place at all levels. Funding, community support, effective infrastructure, and resources availability must support optimum and equitable programs and science teaching and learning.

Key to student success in science is high-quality science teaching. We believe that teachers should be provided professional opportunities through collaboration to learn science content and practices according to the new NGSS. Beyond being well equipped to teach accordingly, teachers must also be provided training on how to effectively interweave science with language and literacy. In addition, teachers need skills to know how to create science classroom environments that promote inquiry in order to nurture the innate curiosity of young science minds.

With the advent of a proliferation of STEM jobs on the horizon, the Science Department is positioned and committed to preparing our students well for college and the future job market, as well as equipping them to be informed and science-literate citizens of the 21st century.

Operating Principles (Theory of Action)

Theory of Action for Improving Student Achievement in Science

Central Leaders	Site Leaders	Teachers	Classrooms	Students
If **Central Leadership** provides quality professional learning, appropriate resources, and accountability that supports the implementation of innovative practices in science.	And if **Site Leadership** shares that responsibility and creates the culture, conditions, and competencies necessary at each school site.	Then **Teachers** will develop science knowledge for teaching and use the Inquiry Cycle to shift their professional practices.	And they will implement those practices in the Instructional Core of every **Classroom** for every student.	And in turn, **Students** will also shift their practices resulting in increased achievement.

Central Leaders	Site Leaders	Teachers	Classrooms	Students
• Develop and manage a vision with clear goals • Promote professional capital • Nurture the academic demand of the content and curriculum, and understand grade level expectations • Employs evidence-informed decision making • Allocate resources strategically • Model the collaborative practices envisioned for sites and students	• Develop and manage a vision with clear goals • Develop and build high functioning teams within schools • Create a culture of observation and feedback, implement an evaluation cycle, use effective coaching strategies, and engage courageous conversations in service of student achievement • Build strong curriculum and content, understand grade level expectations, use data for instructional decisions	• Understand deeply the science they are teaching • Reflect constantly on their practice • Build their human capital through social capital • Use the Inquiry Cycle and formative assessment evidence in collaboration with each other to plan and adjust instruction • Keep parents and other partners informed and engaged • Work with school leaders to support change efforts • Connect everything back to their students	**Instruction** • Provide students with common engaging and relevant science experiences • Focus on deeper understanding through academic discussions, writing, and reading • Use sound pedagogical strategies (e.g., hands-on, science talk, and scaffolds) • Connect science and literacy to accelerate language learning for ELs • Teach, model, and reinforce socio-emotional competencies • Hold students accountable for explaining their reasoning **Curriculum** • Focus on the 3 dimensions of NGSS • Create new units or adapt current units aligned to NGSS **Assessment** • Use formative assessment strategies • Analyze student work and engage around key science concepts	• Communicate their reasoning effectively through academic discussions, revised explanation, and viable arguments • Perform well on performance tasks and other assessments that require explanation and reasoning • Build a positive science identity and be metacognitive about their learning with a growth mindset

Appendix G. Sample Program Elements Matrices

The Early Implementer districts each included seven elements in their NGSS implementation plans: instruction/teaching, professional learning, curriculum/resources, assessment, community/parent engagement, policies/practices (including LCAP), and equity. Below are samples for four of the seven.[11]

Sample PEM for Instruction/Teaching

Element Component	Here We Are	Moving Along	Reach for the Stars!
Quantity of Science Instruction	The amount of science taught varies among schools and in classrooms district-wide Factors include: • procedure/history/policy • some driven by time constraints • teacher comfort/confidence Kit refurbishments	Schools across district work out plans and develop schedules to meet science education instructional time recommendations K–2 weekly minutes = 75 3–5 = 150	Science teaching and learning and implementation of NGSS is an expectation at every grade level district-wide (Ideally, 150 min/week K–2, 300 min/week 3–5, and year-long 6–8) The minutes in elementary science should reinforce literacy/ELA and math CCSS (integrated units of instruction)

11 Not all available examples were included in these appendices. For most components of the NGSS implementation plan, more samples can be obtained by emailing Kimberly Nguyen (knguyen2@wested.org) and specifying the appendix of interest.

Element Component	Here We Are	Moving Along	Reach for the Stars!
Student-Centered / Inquiry	Teachers are overwhelmed with starting from scratch No sample CA NGSS lessons are universally available 5E and inquiry based lesson planning is minimal or unknown (not systemic) No district roadmap, conceptual flow, or CA NGSS aligned storyline for each grade level Teachers struggling to develop/ implement performance tasks and Project Based Learning (PBL) experiences Teachers do not have understanding/ experience with engineering or the design cycle Survey Data indicated that 50% of Teachers felt "Not Prepared"	CA NGSS roadmaps are developed for each unit of study at each grade level Teacher education/training supports and develops comfort levels with CA NGSS, 5E instructional design and inquiry in the classroom Development of sample/ exemplar lessons to inform classroom practices aided by instructional support videos to see classroom implementation Teachers given the opportunity to collaboratively learn how to develop and implement performance tasks and PBLs Teachers given the opportunity to learn how to implement the design cycle and add engineering tasks into their CA NGSS units Teacher developed Design Thinking projects begin to incorporate engineering into science instruction. 62.9% of teachers included student generated analytical thinking as an element present in science notebooks.	A complete NGSS roadmap for every grade level (created by teachers) being used district-wide. Understanding of the dimensions of NGSS and what they look and sound like in a classroom. Teachers comfortable with teaching CA NGSS PEs by building toward PEs and not teaching one at a time (i.e., PEs not treated as a checklist) Teachers have sample/ exemplar lessons that they use to inform their teaching. Teachers use 5E and inquiry to develop NGSS lessons. 100% of student notebooks will include student generated analytical thinking.
Tech Integration SAMR	Teachers have various levels of comfort, understanding, and use of technology integration with science and other content areas Some teachers integrating tech meaningfully into science 1:1 implementation coming in 2015–2016 Inconsistent tech across district	Science PD integrates content and technology use NGSS "point of contact" clearinghouse developed as a place for teachers to share learning instructional support videos and/ or modules developed to assist with NGSS instruction teachers leverage PD360 videos/ system to augment NGSS skill sets as appropriate Learning sequences developed that demonstrate integration of tech (moving from the Substitution level to the Redefinition level). Current survey data indicated 33% of K–5 teachers feel prepared or very prepared to integrate tech into Science instruction	Teachers actively integrating technology into CA NGSS units Instruction utilizes Technology at all 4 SAMR levels as appropriate 100% of Teachers will feel prepared to integrate tech into Science Instruction

Element Component	Here We Are	Moving Along	Reach for the Stars!
Science Notebooks	Wide range of Student Science Notebook use across district place to store stuff/organizational tool vs. sensemaking teacher directed-->student directed CaMSP Professional Development around "4 Essences" and notebook as a thinking tool teachers still in various places of use and comfort Strong potential for integration with CCSS and literacy	NGSS and CaMSP Lead teachers provided PD for Sensemaking Science Notebooks (4 Essences, engineering design) Notebook usage in science shifts from teacher driven---> student driven NGSS Lead Teachers and CaMSP Lead Teachers share effective notebook strategies at site and grade level Notebooks used in cross-curricular projects/sequences integrating science, literacy and math All science teachers in LUSD receive basic Science Notebook PD Rubrics/tools developed to help teachers gauge their effectiveness with science notebooks. 62.9% of teachers reported student driven analytical thinking present in student notebooks.	All science instruction incorporates Sense Making Notebooks, integrates science and literacy Teachers utilizing rubrics/tools to gauge their effectiveness in using science notebooks and adjust instruction as appropriate Ongoing PD around Science Notebooks Notebooks are student driven rather than teacher driven. 100% of student notebooks will include evidence of student driven analytical thinking.
3-Dimensional Instruction (DCI, CCC, SEP)	Minimal understanding of CA NGSS: performance expectations (PEs), 3 dimensions (core ideas, practices, crosscutting concepts), or shifts 3-dimensional instruction is unknown for most NGSS CLT is working toward 3D learning and debriefing with each other Teaching at the "nexus" of the 3 dimensions of NGSS is incidental and unrecognized if it happens, 59% of teachers indicate feeling "unprepared" in 3-D instruction.	Protocols developed that help teachers/admin recognize what 3-Dimensional instruction looks like in a classroom • evidence • student work • lesson design Metacognition Science and Engineering Practices purposefully integrated into instruction CLT and NGSS Lead Teachers integrating SEPs/DCIs into instructional sequences with reference to CCCs Lessons/learning sequences developed that build TOWARD Performance Expectations	Teachers collaboratively plan and implement 3-dimensional science instruction based on phenomena SEPs, CCCs, and DCIs seamlessly integrated into science instruction and assessment

Element Component	Here We Are	Moving Along	Reach for the Stars!
Instructional Equity	Science is currently not given equal weight to other content areas in the classroom Science is marginalized at the expense of "blocks" of ELA/Math in many sites/classrooms ELD/RSP/SPED/Speech students are often pulled out of science so they don't miss ELA/Math instruction .Survey data indicated 78% of teachers reported Speech or RSP students were pulled out of Science instruction. 33% indicated ELD students missed Science instruction. Quality of science instruction varies widely due to teacher quality/prep/confidence/ preference Instructional materials unevenly distributed or difficult to access for some. Survey results indicate that 61% of teachers feel science kit refurbishment represents a challenge to Science instruction.	Science instructional minutes on par consistently with other content areas Students not pulled out of science instruction for ELD, rather ELD instruction is integrated into science RSP/SPED students not pulled from science instruction All students receive science instruction Instructional Materials located and inventoried — Refurbish Science Kits	All students receive high quality science instruction equal to their peers All teachers are equipped with the learning, tools, and supports to implement a high quality science program Instructional materials are equally accessible for all teachers and students

Element Component	Here We Are	Moving Along	Reach for the Stars!
Teacher Content Understanding	Many elementary teachers currently lack the deeper science content understanding to effectively teach NGSS as intended (deeper into content, SEP, CCCs) Middle school teachers may be teaching out of their comfort level/content expertise as NGSS shifts begin CaMSP grants have provided adult level science content to approximately 30-40 K-8 teachers of science over the last 5 years Content understanding around SEPs and CCCs need to improve for effective NGSS implementation	Continued professional development for NGSS and CaMSP Lead Teachers around science content Continued professional development for NGSS CaMSP Lead Teachers around 3 dimensions of NGSS • in depth with SEPS and CCCs Online PD courses resources identified or developed to assist all district teachers with Science Content (NSTA Sci Packs, etc.) • district level incentives provided for attending PD Outside experts/PD opportunities/lecture identified and offered to assist all teachers with Science Content and to build/ignite passion for science instruction	Teachers adequately prepared and comfortable teaching NGSS content in a way that faciliates deep conceptual understanding for students 3-Dimensional planning, instruction, student learning demonstrate facility with all 3 dimensions Teachers are planning and students are learning at the "Nexus" of the 3 dimensions Robust system of PD science content modules in place and accessible for teachers with self monitoring and district incentives
Integration with other Content Areas/CCSS	Science, when taught, is most often taught in isolation Some teachers are starting to look for connections between science and CCSS Some teachers are beginning to integrate cross-curricular units. 73% of Elm teachers surveyed felt somewhat or not prepared to integrate science and CCSS ELA content. 84% felt not prepared or somewhat prepared in integrating Math and Science curriculum. • Elementary • Middle • Design Thinking/PBL projects provide opportunities for integration	Lessons are developed to integrate CA NGSS, CCSS, and other content areas a few units or learning sequences per year Templates/guides developed to assist teachers with integration across the content areas	Middle school science teachers explicitly integrating CCSS into CA NGSS units/lessons and collaborating with interdisciplinary colleagues Elementary teachers are integrating and implementing cross-curricular units (CA NGSS & CCSS). Resources and templates in place to assist with integrating CCSS and NGSS

Sample PEM for Professional Learning

Element Component	Here We Are	Rolling Along: Invitation and Transition	Reaching for the Stars: Full Implementation
NGSS and Content Knowledge – Core Lead Team (Teacher and Admin) and Lead Team	Core Lead Team: 8 teachers, 3 administrators, project director/science curriculum coach NGSS Lead Teachers: 35; Every school represented, all grade levels TK–8 represented (cross district), all middle school science teachers, 1 ELD Coach, 1 ELD Lead Teacher, 3 SPED teachers representing K–8 special needs Leadership and NGSS Training for NGSS Core Lead Team: • WestEd Institutes and Academies Aug 2014, Jan 2015, June 2015 • TLC Days 2014/15 school year; Fall 2015 • 6 Technical Assistance Days 2014/15 and fall 2015 NGSS Lead Team Training: • May 2015 Kickoff for LT with Engineering Lesson participation • Summer Institute Participation July 27–31 • 2 TLC Days in fall 2015 • Leadership Grade Level Collaboration Sessions during Professional Development Days in Sept and Oct 2015 • Menu Monday Oct. 19 NGSS Leadership Team sessions Release Day or Stipend Trainings: • Example: 6th Grade RO Team Saturday Unit Planning Session , Oct. 24, 2015 Middle School Teachers regularly attend Science in the River City sessions at CSUS (SIRC) and other Regional Prof. Dev. elementary teachers attend occasionally.	Continue training for NGSS Core Lead Team: • WestEd Institutes and Academies Jan and June • TA Days throughout the year: CLT members shadow Project Director and Regional Director during TLC Lesson Studies 15/16, Begin leading teams 16/17 as ready; continue leading teams 17/18 • Admin Training Opportunities as scheduled Lead Teachers continue training: • 4 After School Mtgs (Jan., Feb., March, May) 2015/16 • Continue with Leadership Team after school meetings each year • 2 TLC Lesson Study Days spring 2016 • Summer Institute July 18–22 2016, July ? 2017 • 4 TLC Lesson Study Days for each grade level team per year • Voluntary District Wide PLCs by grade levels choose science collaboration • School site, district, and grade specific PLCs select science collaboration • Voluntary Wednesday Collaboration used for 6–8th grade collaboration and articulation. • Continue with District Wide Professional Development day opportunities for Lead Teachers to Deliver and/or provide separate sessions for NGSS Leaders (Prof Dev. Days, Menu Mondays, etc.)	Continue training for refinement of practice for NGSS Core Lead Teachers through WestEd Institutes and Academies, TLC and TA Days Science Teacher Leader Opportunities continue. Continue NGSS Lead Teachers training: • After School mtg at end of year for next year planning • 4 After School Mtgs • Institute each summer • 4 TLC Lesson Study Days • PLC with grade levels • Additional collaboration/ planning after school or release day opportunities regularly supported within the district system Ongoing District Wide PD Grade Level Spans K–2, 3-5, 6-8 or other configurations as determined • Fall NGSS Practices /CCC Engineering Experience with • Fall Engineering Experience October 2016 NGSS Practices (experience, grade level 5E Lesson Plan example, more engineering experiences) • After School voluntary NGSS grade level trainings with stipends featuring science kits and pedagogy • Voluntary release day grade level planning Science planning and collaboration fully integrated in grade level PLC work at all grades at site and district levels

Element Component	Here We Are	Rolling Along: Invitation and Transition	Reaching for the Stars: Full Implementation
NGSS and Content Knowledge – Core Lead Team (Teacher and Admin) and Lead Team *(continued)*		• Middle School Teachers share content expertise with other grade levels (e.g., 7th grade share Cells with 6th grade and develop NGSS 3D elements together to produce NGSS learning kits). Other Release Day or Stipend Opportunities: • Release Day or Stipend NGSS Learning Segment Planning and Preparation: for District NGSS Learning Kits • Release Day or Stipend NGSS Planning Days with Project Director or CLT Support State or National Level Professional Learning Opportunities: CA Science Educator's Conference each year – support teacher attendance; State NGSS Roll-Outs, San Joaquin COE offerings, Sacramento COE offerings Regional Professional Learning Opportunities, e.g., SIRC (Science in the River City at CSUS): Elementary registration to attend SIRC Sessions (3 fall, 3 spring, and Super Saturday) as topics apply to specific grade levels. (MMS use Educator Effectiveness Funds) (Apply some as basis for creating NGSS learning kits.) ELA and Math District Curriculum Coaches receive training related to NGSS and their areas of expertise. CLT and LT begin establishing networking with science leaders and teachers beyond the district to expand Science Professional Learning Community.	Reaching Outward and Establishing Science Professional Learning Communities • CLT and LTs present and attend local, regional, and state conferences. • CLTs and LTs continue to expand networking and sharing of experiences and ideas. Science Leadership Opportunities supported by district. Continue with Regular Tech support in NGSS planning and Implementation with Tech curriculum coach and Coordinator of Instructional Technology Integration and Innovation with NGSS Lead Team as well as District-Wide teachers.

Element Component	Here We Are	Rolling Along: Invitation and Transition	Reaching for the Stars: Full Implementation
NGSS and Content Knowledge – DISTRICT WIDE: Teachers	District Wide Professional Development Days • District Wide PD Day September 14, 2015 Mandated NGSS Architecture / Engage Experience; Grade Spans K–2, 3–5, 6–8 • District Wide PD Day October 12, 2015 Mandated NGSS Practice (experience as adult learners 5E Lesson Plan example); Grade Spans K–1, 2–3, 4–5 with 6th, and 7–8th Concurrent Other District Wide Opportunities • Menu Monday Oct. 19 after School STEM Workshop • Some grade level teams have chosen to use Voluntary Wednesday meetings for science collaboration at least once in the fall	CLT and Teacher Leaders develop professional learning for District Wide Professional Development Days. Topics may include: transitioning, student-centered teaching, integrating NGSS and CCSS, DCI, SEP, and CCC (Time to plan/prep); formative assessment using student work, etc. District Wide Professional Development Days: • District Wide PD Days – 2 per year, Mandated NGSS by grades or grade spans, Inkind budget • After School voluntary NGSS grade level trainings with incentives featuring science kits and pedagogy for each grade level — budget • Release sub or Stipend for NGSS grade level planning and implementation in the classroom with Project Director or CLT support (Lead Team and Other District Teacher participants) — budget • ELD and Science Text Integration and designated strategies Release Sub Time (supported with ELD Grant) other grant budget • Release subs for observing classrooms — budget • Support for developing and/or implementing Problem Based NGSS Learning Modules Personalized NGSS Professional Learning Opportunities (including above release/sub time) as well as other venues such as: • Digital online professional learning sessions developed and shared by PD, CLTeachers, and admin	Ongoing District Wide PD Grade Level Spans K–2, 3–5, 6–8 or other configurations as determined • NGSS Practices /CCC Engineering Experience with • Engineering, NGSS Practices, grade level 5E Lesson Plan example, more engineering experiences • After School voluntary NGSS grade level trainings with incentives featuring science kits and pedagogy • Voluntary release day grade level planning Personalized NGSS learning opportunities – system set up for teacher requests, individual completion of Prof Dev in personalized setting, virtual opportunities for collaborating, and innovative venues not yet thought of. • Continue with related items listed in middle column. Science planning and collaboration fully integrated in grade level PLC work at all grades at site and district levels Joint ELA and/or Math and NGSS Professional Learning sessions designed and delivered by Instructional Coaches and other teacher leaders. NGSS Problem Based Learning Modules established at each grade level. Designated PLC time for NGSS work.

Element Component	Here We Are	Rolling Along: Invitation and Transition	Reaching for the Stars: Full Implementation
NGSS and Content Knowledge – DISTRICT WIDE: Teachers *(continued)*		• Resources and materials available through District Curriculum Corner or connected website. Time and budget and web manager support. • Explore developing and implementing in-district NGSS summer institute. More Teachers select NGSS as their Teacher Effectiveness Goal, or integrate other goals (Writing, Reading, Math) with NGSS opportunities.	
Administrators	All site principals attended NGSS Summer Institute Friday July 31 Administrator Session scheduled as part of their contract day by Superintendent and Curriculum Director. Many administrators attended the Fall 2015 September and October NGSS District Wide Staff Development Sessions Administrators receive NGSS update and complete needs assessment during Fall 2015 monthly meetings. Site Administrators: Limited NGSS knowledge and limited understanding of what NGSS sense-making learning looks like in classroom or outside experiences. District Administrators and Cabinet: Some NGSS knowledge (superintendent, director of curriculum) and awareness of NGSS's role in 21st century College and Career Readiness Some District Administrators understanding of NGSS integration and support of CCSS.	Administrators receive ongoing district training on NGSS content, pedagogy, and implementation expectations and needs. Science is addressed at academic team/conference meetings 3 times per year and CCSS integration. Staff events related to NGSS at each site. NGSS Administrator Trainings conducted regularly at District Admin Meetings by CLT Administrators with Project Director support once per trimester: science shifts for NGSS, classroom shifts, sense-making, observation tools, connections with CCSS CLT Admin use observation protocols with CLT and/or LT NGSS Admin Sessions included as regularly scheduled sessions in July/Aug admin preservice days. April 21st evening and 22nd all day administrator symposium for outside districts	Site Administrators have knowledge of NGSS pedagogy and content to support classroom teachers in refining instruction and classroom practices. Administrator NGSS professional learning continues as regularly scheduled sessions District Administrators and cabinet have knowledge of NGSS pedagogy and content to inform district level decisions that support NGSS implementation All District Administrators prioritize and advocate NGSS and STEAM to support developing 21st century college and career ready skills and be preparing students to compete in the world market in STEM careers All District and Site Administrators expect and support science instruction with NGSS in every classroom K–8.

Element Component	Here We Are	Rolling Along: Invitation and Transition	Reaching for the Stars: Full Implementation
Administrators ***(continued)***	Some awareness of NGSS role in district initiatives such as personalized learning, strengths, technology, blended learning, innovation and entrepreneurship Limited NGSS content knowledge (DCI, SEP, CCC, PE)		
School Board	Board NGSS updates fall 2014, spring 2015, fall 2015 The School Board has received 3 presentations related to NGSS, the Early Implementers grant, and progress toward implementation.	Regular Board NGSS updates at regularly scheduled sessions. Increased awareness of importance of STEM for college and career readiness. Recognition of ease of integration through PD and/ or mixed media (readings, Edivation, etc). School Board Members receive regular updates on NGSS implementation progress. Presentations/videos etc. to School Board Members to illustrate and highlight success of NGSS implementation and illustrate 21st century/CCSS connections	School Board Members have knowledge of NGSS necessary to inform district level decisions that support NGSS implementation Continued School board updates, presentations, and opportunities to observe NGSS classrooms and outreach efforts.
Technology	Beginning to incorporate technology within NGSS learning sequences.	Develop and embed a variety of technological applications within the NGSS learning sequences. Regular Tech support in NGSS planning and Implementation with Tech curriculum coach and Coordinator of Instructional Technology Integration and Innovation.	NGSS units incorporate embedded technological applications when applicable to use to learn and explain science. Continue with Regular Tech support in NGSS planning and Implementation with Tech curriculum coach and Coordinator of Instructional Technology Integration and Innovation with NGSS Lead Team as well as District-Wide teachers.

Element Component	Here We Are	Rolling Along: Invitation and Transition	Reaching for the Stars: Full Implementation
Funding (See also Policies/ Procedures PEM and Action Plan)	Limited District Funding for within district and outside of district PD opportunities (e.g., SIRC, STEM Conference, CSTA Conference, SASP)	NGSS Professional Development funds begin to be recognized as a priority and are accounted for at site and district level budget consideration. Reach out to businesses and partnerships for funding.	NGSS Professional Development funds fully integrated into LCAP and other funding avenues for within district and outside district state and national science experts.
Teaching/Learning Collaborative	Limited opportunities to meet with local Early Implementers such as Tracy and Oakland	Establish relationships to increase contact, communication and collaboration with other Early Implementers. Fund offered PD opportunities for Early Implementers to increase connections.	Funds provided for ongoing collaboration with other Early Implementers, and other CA districts
Assessment (See also assessment)	No training in NGSS assessment criteria and attributes	Begin training and working with NGSS assessment criteria and attributes	All teachers and administrators have been trained in and use quality NGSS aligned formative and summative assessments to inform instruction, improve practice, and increase student achievement; ongoing training occurs for new and continuing teachers
Project-Based Learning **Cross-Curricular / Integration with Common Core Training**	Limited implementation and depth of knowledge of project based learning Limited Cross-curricular training Two district-wide NGSS Professional Learning sessions included common core integration examples.	Teachers will "dive in" to at least one unit or lesson sequence based on phenomena and NGSS practices and/or cross cutting concepts. CLT will provide teacher developed learning sequences for upcoming years that integrate science with common core. Continued training with integration opportunities.	Teachers design and implement integrated Project Based Science Learning Teachers plan and implement quality cross-curricular lesson sequences

Element Component	Here We Are	Rolling Along: Invitation and Transition	Reaching for the Stars: Full Implementation
Engineering	CLT TA Day focus on technology and engineering design process Lead Teacher Kickoff May 2015 focus on engineering design process. One CLT taught the engineering design process using an Engineering is Elementary Unit. Some elementary schools have Engineering and/or Robotics Clubs.	Provide district PD that shows teachers how and what engineering looks like in grade level classrooms. Provide district-wide engineering design process training using a simple activity. Examine, identify, and purchase an EiE unit for each grade level. Make revisions to correlate with NGSS. Provide after school professional development with incentives. Develop engineering "problems" that connect NGSS to DCIs, cross-curricular studies (e.g., Kinder fairy tales, 5th grade Boston Tea Party); provide training. Make more explicit connections with NGSS in after school club offerings, such as Engineering, Robotics, Habitat/Gardening Clubs.	District provides comprehensive Engineering training and grade specific examples for NGSS and CCSS applications. Teachers plan and implement integrated lessons incorporating engineering practices throughout the year. EiE units continue to be refined with more explicit NGSS practices and CCCs. Provide opportunities for Gateway to Engineering Pathways to connect with High School Academies (BEST Academy – Bio, Engineering, Science, Technology)
Career Education Connections	Few science career connection experiences.	Include career spotlights and applications in NGSS Learning Kits.	Science Professional Development incorporates Career connections as part of the process protocols and template.
Environmental Education	See Community Partnerships Section		

Sample PEM for Policies/Procedures

Here We Are	Rolling Along: Invitation and Transition	Reaching for the Stars: Full Implementation
• CA NGSS is addressed in the Blueprint/LCAP (Strategy 4) and LCFF. • CA NGSS PD is supported by Early Implementation Initiative funding. • The district continues support for refurbishment of K–5 science kits. • Number of minutes of science instruction varies K–6.	• CA NGSS becomes an Action Plan item in Strategy 4 of the Blueprint/LCAP with funding from LCFF. • Specifically address CA NGSS in Strategy 7 Action Plans 5,6,7 of the Blueprint/LCAP with funding from LCFF. • Dedicated funding in the LCAP for ongoing NGSS/STEM PD and additional district resources to support this work (i.e., elementary and middle school CA NGSS Core Leadership Teachers). • Review LCAP allocation for materials and resources in years 3 and 4. • The district continues support for refurbishment of K–5 science kits. • Some K–5 teachers will integrate science instruction throughout the school day with: English Language Arts (ELA), English Language Development (ELD), and Mathematics Common Core State Standards (CCSS). • District core Secondary Teachers scheduled two separate periods (math and science). • Middle Schools have scheduled science classes in grades 6–8.	• District funding in the LCAP to support the growth of district-wide science training for teachers and administrators. • District resources and funding in LCAP to support all schools developing engaging CA NGSS/STEM extensions for their students. • Dedicated funding in the LCAP for ongoing CA NGSS/STEM PD and additional district resources to support this work (i.e., Director of CA NGSS/STEM) • Review LCAP allocation for materials and resources in years 3 and 4. • LCAP funding allocation for the adoption of new curriculum (science kits) is not limited to one publisher (curriculum is adopted based on best fit for grade level and curriculum needs). • K–8 Science is a protected core subject within the different school schedules. • LCAP funding for ongoing sustained CA NGSS PD for teachers. • Local science assessments given K–8. • Board goal to specifically address Science education through NGSS.

Sample PEM for Equity

Element Component	Here We Are	Rolling Along: Invitation and Transition	Reaching for the Stars: Full Implementation
School Parity and Equity	Training has begun for all district teachers to learn the basics of NGSS expectations. Different schools and different grade levels do not offer equitable experiences in science instruction with students during the school day. Not all schools offer the same opportunities for Science/NGSS/STEM education within and outside of the school day. Some schools offer after school science/STEM related activities. Others do not. Minimal Career Awareness in STEM fields. English learners struggle with access to science content and text. Some ELD training includes science content and text.	Training and materials are developed and designed to guide teachers through teaching science by students using the practices for learning the DCIs and using the CCCs to think about what they are learning and make connections. Schools begin to offer STEM opportunities after school through BFLC and Teacher Led Clubs (Robotics, engineering, science) Students are provided with experiences with STEM careers (i.e., guest speakers, etc.) Teachers receive ELD training in RALLI and CALL strategies using science content and text.	The quantity and quality of materials designed and developed to guide teachers through teaching science by students using the practices for learning the DCIs and using the CCCs to think about what they are learning and make connections is sufficient to support teachers and students. All schools fully embrace Science/NGSS/STEM education during the regular school day and in after school offerings. Career Awareness in STEM fields embedded within instruction through the year as well as special events. RALLI and CALL strategies are embedded within science instruction in concepts, practices, crosscutting concepts as well as text.
Equity of Materials	Inventories indicate that schools do not all have the same materials and resources, and that use of those materials is minimal at some schools and/or grade levels. NGSS related and Engineering clubs or groups are not offered equally among all schools.	Materials and resources are distributed and purchased in quantities that bring their availability to parity across school sites and grade levels. Teachers receive training in materials use to increase familiarity so that they will provide experiences doing real science with real science tools with their students. Set in place opportunities that provide science and engineering related clubs at more schools.	Materials and resources are distributed and used equitably across all sites. Teachers and students use science tools and materials at all sites and all grade levels so that students become familiar and fluent with their use for learning and doing science through science and engineering practices. NGSS related and Engineering clubs/groups are offered equitably at all sites.

Element Component	Here We Are	Rolling Along: Invitation and Transition	Reaching for the Stars: Full Implementation
Equity of Time **(See also Policy/ Procedures)**	Unequal access/time to teach science due to other time restraints and school site and district initiatives.	Develop a plan and incorporate instructional strategies to help provide time for equitable science instruction. Times may be different for different grade levels or grade level spans. Examine district and site practices that are roadblocks to designating instructional minutes for science in a quantity and quality that indicates its value as a core subject; seek solutions. At district and site meetings, examine organizational consistency expectations that can be perceived as roadblocks to science instructional minutes and revise to include flexibility with ELA and other areas so that time is protected for science instruction.	Dedicated science time for grade level spans. Literacy includes science text and content. However, teachers do not use this to replace science instructional minutes, but rather to free up time for real science instruction. District and site practices encourage and support quality science instructional minutes that signify science as a core subject.
Equity of All Student Groups and Individuals **(See also Policy/ Procedures)**	Elementary Special Education student IEPs may or may not include science instruction. Some IEPs specify inclusion in science, but in practice, this time is often minimal and of "token" quantity of minutes. Other services, such as speech, are sometimes scheduled at the same time as science inclusion.	District SPED program specialist and teachers work together to review and establish protocols and policies during IEPs that support SPED student participation in science instruction.	Protocols and policies are refined for the IEP process to ensure special needs learners receive and experience equitable science instruction.
Advocacy	Advocacy for science has been lacking or occurs in small "islands" at some schools. Advocacy often depends on parents in the community or administrative support depending on interests at the time.	Science advocacy from district, administration, teachers, students, and community is evident. Advocacy becomes organized and collective to influence current practices, funding, and science instructional minutes.	Advocacy has resulted in equitable science education for all students in all grade levels in all schools.

Element Component	Here We Are	Rolling Along: Invitation and Transition	Reaching for the Stars: Full Implementation
Equity in Policy, Professional Learning, Instruction, Assessment, Curriculum Resources, Community / Parent Partnerships	Current status of equity is addressed in each of these PEM elements.	Improved and continuously improving equity status is indicated in each PEM element and corresponding actions.	Equity in all PEM areas has been addressed and solutions have been implemented. Equity is continually addressed in cycles of improvement in all areas of policy and everyday practice to ensure all students experience quality science learning using the NGSS.

Appendix H. Sample Action Plans

While the PEM set the course for implementation, it did not include many details. In contrast, the action plan matrix specifies, for each element in the PEM, information such as:

- Events and activities
- Roles and responsibilities
- Outcomes
- Dates and times
- Budget implications

Districts completed actions plans with varying degrees of specificity depending on how much information they had at their disposal during the planning process. For some elements, districts created very detailed plans that included all or most of the information listed in the bullets above for each school year. For other elements, about which limited information was known (e.g., availability of curriculum materials), action plans consisted of a more general "summary of activities." A sample detailed action plan and a sample "summary of activities" plan are presented below.

Sample Detailed Action Plan January 2016–June 2016

Date	Activity	PEM Element	Where	Target Audience	Responsible (Who)	Budget	Check Complete
Aug	All Middle School topics shifted to Grade Levels in Integrated Model	Teaching and learning Equity	Middle School sites	Middle School Science Teachers	Project Director and TOSA	District Funds (LCAP)	X
Sept.	Informal Science: Awareness of NGSS	Community and Parents	Informal Sites TBA	Informal Educations	Project Director and TOSA	District Funds (LCAP)	X
Oct.	Afterschool Meetings Note-booking CCSS and NGSS K–2, 3–5, 5–8	Professional Learning Assessment Teaching and Learning	Farrell Office	64 Teacher Leaders	CLT, RD, PD, TOSA	District Funds (LCAP)	X

Date	Activity	PEM Element	Where	Target Audience	Responsible (Who)	Budget	Check Complete
Oct.	Protocol Established for Amazon Budget for each teacher AND Protocol for ordering as a site.	Materials and Resources	Web-Based and District	64 Participating teachers and Teacher Leaders	Project Director Admin on CLT team	District Funds (LCAP)	X
Oct-Dec	TLC Set 1 Focus: Note-booking, Lesson Design, Student Work Focus on adapting materials	Professional Learning Assessment Teaching and Learning Materials and Resources	Farrell and School Site	64 Participating Teachers and CLT Shadows Facilitator	PD, RD and CLT team	District Funds (LCAP) Grant Funds	X
Nov 4	Admin. Awareness of NGSS and ELA	Professional Learning Policies and Practices	District Office	All District ADMIN	RD and PD	District Funds (LCAP)	X
Nov. / Dec	Middle School Curriculum Embedded Performance Task	Assessment Teaching and Learning	Classrooms	Grade 8 teachers	PD and TOSA	District Funds (LCAP)	
Dec.	Parent Awareness for NGSS (Family Science)	Community and Parents	Specific sites	School Staffs	PD and TOSA	District Funds (LCAP)	
Dec.	Pilot ELA NGSS Writing Tasks	Assessment	K-5 Sites	K–5 Teachers	TOSAs and District Assessment	District Funds (LCAP)	
Dec and Jan.	Observation Protocol with CLT classrooms	Policies and Practices	CLT classes	CLT teachers and admin.	CLT Admin.	District Funds (LCAP)	
Dec-Feb	Secondary Field Test Performance Tasks 6–8	Assessment	Middle schools	Middle School Teachers	TOSA, PD		
Jan	Expand the CLT Add one admin Add two teachers	Budget LCAP Policies and Practices Professional Learning	District Office	Admin and Teacher Leaders	PD	District Funds (LCAP) 2 people Grant Funds (1)	

Date	Activity	PEM Element	Where	Target Audience	Responsible (Who)	Budget	Check Complete
Jan.	Pilot Performance Task (Grade 6,7,8)	Assessment Teaching and Learning	MS CLT grade level at the site	MS teachers CLT's	PD, TOSA	District Funds (LCAP)	
Jan. 21–23	Statewide Staff Developer Training	Professional Learning	Claremont	CLT	PDs and RDs	Grant, Project Prototype	
Jan–April	Set 2 TLC Focus: Student work as Embedded Assessment and School culture	Professional Learning Teaching and Learning Materials & Resources Assessment Equity	Farrell and School Site	64 Teacher Leaders and CLT Shadows Facilitator	TOSA, PD, RD and CLT	EI Grant Project Prototype CaMSP	
Jan./ June	Instruction Materials Review	Materials and Resources	CLT sites	CLT teachers	PD, RD, CLT	Grant Funds	
Jan. 27	District Wide Grade Level PLC on ELA/ Science: Arguing from Evidence	Professional Learning Policies and Practices	Designated School Sites	K-8	CLT PD and RD	District Funds (LCAP)	
Jan–Feb	CLT Leads Science and Literacy PLC at school site	Professional Learning Teaching and Learning Policy and Practice Assessment	Designated School Sites	Grade Level Participants at CLT sites	CLT, PD, and RD	District Funds (LCAP)	
Feb.	After School Meetings Focus: Note-booking and Modeling 2/9 2/16 2/18	Professional Learning Teaching and Learning Assessment	Farrell	Participating Teachers and CLT	PD, RD, TOSAS	District Funds (LCAP)	
March	TA Day Develop List of Family Community Events to Support NGSS	Community and Parents	Farrell	CLT	CLT PD, RD, and TOSA	District Funds (LCAP)	

Date	Activity	PEM Element	Where	Target Audience	Responsible (Who)	Budget	Check Complete
March	SNAP Field test of Assessments	Assessment	Farrell	Selected Participating teachers and CLT	PD and RD	SNAP Funds for Training	
March	1. NGSS Study Session for Board (Includes changes in middle school high school courses) 2. Members are invited to scheduled lessons at CLT sites	Policies and Practices Equity	District office	School Board	TOSAs	District Funds (LCAP)	
March	Build awareness for NGSS shifts to be shared with CVEP	Community and Parents	CVEP Meeting Place	CVEP	PD, RD, TOSA	District Funds (LCAP)	
March	Parent Awareness One PD on 3-D Learning in conjunction with the Parent Center	Community and Parents Professional Learning	Specific Sites and the Parent Center	Parents and caregivers	PD and TOSA	District Funds (LCAP)	
April	NGSS Professional Learning for Informal science educators	Community and Parents	TBA	Informal Educator Network	TOSA and PD	District Funds (LCAP)	
April–May	CLT facilitates PLC on Science and Literacy	Professional Learning Teaching and Learning Policies and Practices	School Sites	Grade Levels at CLT sites	CLT, PD, TOSA and RD	District Funds (LCAP)	
May 2	TA: PD for CLT TBA	Professional Learning	Farrell	CLT	TOSA, PD, RD, CLT	Grant	
May	After School Session Focused on: Facilitating PLCs linking NGSS and CCSS using a student work protocol 5/9 5/10 5/17	Professional Learning Teaching and Learning Assessment	Farrell	Participating Teachers and CLT	PD, RD, TOSAS	District Funds (LCAP)	

Date	Activity	PEM Element	Where	Target Audience	Responsible (Who)	Budget	Check Complete
May	Revise Pilot Performance Task (Grade 6, 7, 8)	Assessment	MS grade level leaders	MS Teachers CLTs	PD, TOSA	District Funds (LCAP)	
May	Teacher Survey	Professional Learning: • Time for Science • Student Work as Embedded Assessments • Equity	Web-Based	Participating Teachers and CLT	PD, RD, TOSAs	District Funds (LCAP)	
June 22–26	Statewide Staff Developer	Professional Learning	Claremont	CLT	PD and RDs	EI Grant Project Prototype	
Summary Activities Over Periods of Time:							
Oct–June	Establish Organization Plan at each Site: Inventory	Materials and Resources	All sites	Elementary and Middle School Sites	TOSA and Admin on CLT	District Funds (LCAP)	

Sample "Summary of Activities" Action Plan

This is a sample "summary of activities" action plan that one Early Implementer district developed. Note that information relating to two and a half academic years are included on one page, in contrast to the detailed plan where each academic year was treated separately and in greater detail.

Curriculum / Resources Spring 2016–June 2018

Spring 2016	Budget	2016–2017	Budget	2017–2018	Budget
CLT elementary teachers to field test NextGen FOSS materials at 3rd and 5th grade	WestEd	TLC teachers will use NextGen FOSS Teacher Guides to plan their lesson studies	District funds	Prepare materials management system for transition to NextGen FOSS	District funds
Elementary Science Team develops NGSS transitional instructional plans and assessments (SIRA) using Ca FOSS curriculum (3–5)	Grant	Elementary Science Team begins to develop NGSS transitional instructional plans (SIRA) using Ca FOSS curriculum (K–2)	Grant	Elementary Science Team continues to develop NGSS transitional instructional plans (SIRA) using Ca FOSS curriculum (K–2)	District Funds
Elementary Science Team identifies needs for district NGSS toolkit and begins development	District Funds	Elementary Science Team develops and shares district NGSS toolkit with Networks and principals	District Funds	NGSS toolkit is used for professional learning throughout the district, for teachers, principals, and Networks	District Funds
Secondary Team revises tasks, analyzes student work, and collaborates with community partners	Grant	Secondary Team develops a data collection system for benchmark assessments	District Funds	Present summative tasks as summative assessments for reporting and collection to the school board	District Funds

Appendix I. Sample Monitoring and Evaluation Plans

NGSS implementation plans should not be put on a shelf for the duration of the implementation effort. Through the monitoring and evaluation plan, teams commit to use their plans on a regular basis to assess their progress. The following are sample monitoring and evaluation plans developed by three Early Implementer districts.

Monitoring/Evaluation Plan Sample 1

The [district] Elementary NGSS Implementation Plan is designed to be a living, dynamic document that is responsive to district and NGSS needs as they arise throughout the implementation process. In order to determine the effectiveness of the program elements and related actions, the [district] NGSS Implementation Plan includes ongoing systems for monitoring, evaluating, and reflecting upon actions and processes in order to inform future changes to ensure the plan is responsive to the needs of the learners in the district: students, employees, and other community members. Future input and feedback opportunities from multiple stakeholders and users will continue to shape the NGSS Implementation Plan. These include:

1. Formal and informal surveys, both written and electronic, conducted at least once a year with teachers, administrators, and district committees included in the Needs Assessment groups listed in the introduction to this document. Additional stakeholder groups will be surveyed in the near future and annually thereafter:
    - Site Parent Organizations (Spring 2016)
    - Student Survey (Spring 2016)
    - Community Organizations (Kiwanis, Lyons, CAST (Cities and Schools Together), Youth Master Plan and Youth Planning Commission, businesses (as future employers and/or as practicing scientists/engineers), high school teachers/personnel, high school students, institutes of higher education, environmental learning and other partnerships (starting Spring 2016)
2. Surveys and anecdotal responses following professional learning opportunities.
3. Surveys and opportunities to provide feedback during trainings related to NGSS Learning Kits and their design for usefulness in guiding teachers through the three dimensions of the NGSS during lesson sequences. Scheduled sessions for teachers to provide feedback following using an NGSS Learning Kit or teaching learning sequences featured in professional development.
4. Informal gathering of successes, concerns, and needs information by NGSS Leadership Team members during their day-to-day

conversations with teachers, administrators, parents, and students.

5. Reviewing student notebook entries for identifying sense-making, revising, and reflective thinking and informing future steps towards students using notebooks as a personal thinking and recording tool. Reviewing and analyzing other student evidence of science learning.
6. Student and teacher self-reflections on the science learning process, including long-term impacts such as science and engineering career awareness, using the practices, and developing thought processes that incorporate the crosscutting concepts.
7. Reflecting on LCAP and budget process participation and feedback as it relates to science/NGSS implementation and support. Participating in public sessions designed to inform and elicit community priorities and using the information to enact forums for informing community groups of science instructional needs and community impact relevant to community interests.

Data from the above and other feedback opportunities will be gathered and analyzed at least once per trimester by the NGSS Core Leadership Team. This will inform and guide decisions, priorities, and related changes to incorporate in the NGSS plan with program design changes that more effectively accomplish the district level of systemic change that is necessary to fully implement the three dimensions of the NGSS in all classrooms by June 2018.

Monitoring/Evaluation Plan Sample 2

Several methods will be used to monitor and evaluate the progress of the NGSS transition. In years three and four, administrators will be using the NGSS observation protocol[12] to get a snapshot of the implementation of NGSS. These walkthroughs are not evaluative but to see what types of professional development/support teachers need in order to continue their transition to NGSS. The principals will share results with their staffs. District Office personnel will also use these forms and will meet directly with principals to share their findings. These findings will also be discussed during principal meetings to see where the district is, as a whole, on the transition timeline. In addition, NGSS will be a regular agenda item at principal and cabinet meetings. The Superintendent is committed to the implementation of NGSS and being informed regularly on the district's progress.

District PLCs will be encouraged to include science on a regular basis in addition to their science-focused PLC. The agenda and minutes of these meetings will be shared with the project director and other administrators. K-5 teachers will be required to have science on their weekly agenda and that the instruction meets the minimum requirements now required by the districts. Administrators and instructional coaches will support the transition into these new requirements by working closely with teachers on the "how" of including regular science instruction in their classroom.

In years three and four, teachers will begin developing grade-level story lines and curriculum guides. These will be more of a skeleton at first,

12 This refers to an "evidence of learning" tool developed by Early Implementers Initiative leaders to help administrators understand and learn about what NGSS looks like in the classroom. For more information, look for Early Implementers evaluation report #5, *A Guide to Tools and Strategies for NGSS Implementation,* slated for release in March 2018.

but will give teachers practice with the content and teaching with bigger ideas in mind. These products will be shared with colleagues at District PLCs and site administrators.

The Assistant Superintendent is determined that the district needs to shift away from math and ELA only instruction that is a function of NCLB. She is planning in years four and beyond to develop science benchmark assessments for grades K-8 to see how students are performing and to model performance assessments.

The PEM and action plans will be reviewed in the spring of each year by the Core Leadership Team, Project Director, and Assistant Superintendent of Curriculum and Instruction. Revisions will be made based on the progress and needs of teachers and administrators.

Monitoring/Evaluation Plan Sample 3

The Project Director and the Core Leadership Team (CLT) monitor the PEM as a "living" document adjusted as new information from stakeholder groups becomes available. Each activity on the action plan is evaluated with resulting data and used to inform program design. Suggested Evaluation and Reflection Data include:

- Use data generated from Cadre testing in summer and evaluations to determine needs of our participants
- Use reflection protocol upon completion of TLCs (lesson study)
- Use Concerns Based Adoption Model to show teacher concerns and growth regarding CA NGSS implementation
- After development of benchmarks and end of course assessments, use data to monitor student achievement
- Use stakeholder focus groups /survey monkey to get periodic feedback
- TESS (Teaching Engineering Self-Efficacy Scale)
- Monitor the district's LCAP and LCFF to monitor support for CA NGSS implementation
- Lesson Observation protocol (Achieve) to monitor classroom progress in implementing CA NGSS (can be used by administrators or teacher)

NGSS EARLY IMPLEMENTERS
WestEd

EVALUATION REPORT 4

Developing District Plans for NGSS Implementation

Preventing Detours and Finding Express Lanes on the Journey to Implement the New Science Standards

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