OCTOBER 2019 | EVALUATION REPORT #10

Administrators Matter in NGSS Implementation (2019)

Updated Findings on How School and District Leaders Are Making Science Happen

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NGSS EARLY IMPLEMENTERS

WestEd

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 three NGSS 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 has commissioned 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 the 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 #10, evaluators previously released:

- *The Needle Is Moving in California K–8 Science: Integration with English Language Arts, Integration of the Sciences, and Returning Science as a K–8 Core Subject* (Evaluation Report #1, October 2016)
- *The Synergy of Science and English Language Arts: Means and Mutual Benefits of Integration* (Evaluation Report #2, October 2017)
- *Administrators Matter in NGSS Implementation: How School and District Leaders Are Making Science Happen* (Evaluation Report #3, November 2017)
- *Developing District Plans for NGSS Implementation: Preventing Detours and Finding Express Lanes on the Journey to Implement the New Science Standards* (Evaluation Report #4, February 2018)
- *Next Generation Science Standards in Practice: Tools and Processes Used by the California NGSS Early Implementers* (May 2018)
- *Making Middle School Science Whole: Transitioning to an Integrated Approach to Science Instruction* (Evaluation Report #5, October 2018)
- *Engaged and Learning Science: How Students Benefit from Next Generation Science Standards Teaching* (Evaluation Report #6, November 2018)
- *Investing in Science Teacher Leadership: Strategies and Impacts in the NGSS Early Implementers Initiative* (Evaluation Report #7, February 2019)
- *Collaborative Lesson Studies: Powerful Professional Learning for Implementing the Next Generation Science Standards* (Evaluation Report #8, September 2019)
- *Environmental instruction catalyzes standards-based science teaching: How environmental literacy aids implementation of the NGSS* (Evaluation Report #9, September 2019)

Executive Summary

Administrators need learning opportunities if they are to adequately understand the substantial shifts of the Next Generation Science Standards (NGSS) and support teachers in implementing them. Accordingly, the K–8 NGSS Early Implementers Initiative has consistently expanded the professional learning it provides for administrators, particularly for site administrators, who generally have the most contact with teachers. This tenth evaluation report in the series, intended for site and district administrators and state leaders, highlights:

- The professional learning strategies used by the Initiative to engage and empower administrators to support NGSS implementation (includes two district vignettes)
- The impact of the professional learning on administrator understanding and actions
- The challenges experienced by the Initiative in trying to involve administrators
- Recommendations for increasing administrator help with science implementation

Impact of Administrator Professional Learning Experiences

Administrators in the Initiative reported growing in their understanding of the structure of the NGSS and the shifts in pedagogy required to teach the NGSS. By the spring of 2019, 86 percent of surveyed principals reported understanding the shifts "fairly well" or "thoroughly." They also reported improved understanding of how well the NGSS relate to the Common Core State Standards, the scope of transitioning to the NGSS, and how to help teachers transition to the NGSS. Ensuring that teachers had adequate supplies for science instruction and providing additional time for teachers to collaboratively plan and score student work were two key ways that administrators demonstrated support for NGSS instruction. They also communicated, through their words and actions, that science is important and that it is okay for teachers to experiment in science class.

> *My teachers know that it's okay to take risks, it's okay to fail. It's all part of the process of being a good science student or a scientist. (Middle school principal)*

District administrators signaled that science was a core subject by including the NGSS in their Local Control and Accountability Plans and by mandating minimum instructional minutes per week for science in the elementary grades.

How the Initiative Contributed to Administrator Understanding of the NGSS

Beginning in Year 1 of the Initiative, administrators were included on the Core Leadership Teams. They received extensive professional learning each year and played important leadership roles in district-wide NGSS implementation.

Principals and vice principals participated in a Principal Academy, which included a range of professional learning experiences, such as:

- Participating in sessions tailored for principals at the annual Summer Institutes on topics such as ensuring equity and access to quality science instruction for all students, identifying the characteristics of an NGSS classroom, supporting integration of the NGSS and the Common Core State Standards, implementing the NGSS at the middle school level, and supporting science as a core subject
- Observing a Teaching Learning Collaborative, the lesson study of the Early Implementers Initiative
- Using the Evidence of Learning Protocol to observe science lessons
- Conducting science walk-throughs facilitated by the district Project Director or a Core Administrator
- Attending a presentation by an Early Implementers leader at a district leadership meeting or a school or district professional learning session for teachers

Superintendents were also convened on an annual basis to foster increased involvement and support from upper levels of district administration.

> *I think just the fact that our principal gave staff meeting time to science — because we don't have a lot of staff meetings in our school — was a big signal and it also helped us understand the NGSS. And she did this for three staff meeting days. (Kindergarten teacher)*

Recommendations for Administrators

The report includes NGSS implementation recommendations for site and district administrators, including:

- Build NGSS professional development into administrators' yearly work calendars.
- Provide administrators with collaborative time to discuss successes and challenges of NGSS implementation.
- Provide school administrators with collaborative classroom observation protocols (not for teacher performance review) that facilitate meaningful discussion between principal and teacher about NGSS science instruction, and provide professional development for using them.
- Establish instructional-minute expectations for science instruction that support parity with English language arts and mathematics.
- Include NGSS-aligned science instruction and student achievement in annual Local Control and Accountability Plans.
- Participate in science walk-throughs and Teaching Learning Collaboratives (lesson studies).
- Provide teachers with time to collaborate on science.
- Support and fund teachers in getting needed hands-on science supplies and equipment.
- Regularly put science on the agenda for standing district-wide and school-wide meetings.
- Communicate that science is a core subject and, as such, an instructional priority.
- Explore and implement high-impact ways to include parents and community members in NGSS delivery.

Foreword

In 2017, the evaluation team for the Next Generation Science Standards (NGSS) Early Implementers Initiative published *Administrators Matter in NGSS Implementation: How School and District Leaders Are Making Science Happen*.

This 2019 update, designed to stand alone, reprises and updates the 2017 report information, describes the significant new program elements for administrators that have occurred since then, and reports the resulting kinds of impacts that administrators are having on NGSS implementation and making science a core subject in their schools.

While the first Early Implementer evaluation report on administrators mostly told the story of Core Administrators in the Initiative, this report primarily discusses the site administrators. Site administrators are key to the success of a district's NGSS implementation because they have the most influence on the teachers, who have the ultimate responsibility for transitioning to teaching the NGSS. This is why the Initiative has continually expanded its focus on providing professional learning for site administrators and why focusing this report on the impact of the Initiative on site administrators yields a more meaningful measure of the Initiative's success.

Introduction

There is increasing urgency for administrators to embrace and support implementation of the Next Generation Science Standards (NGSS Lead States, 2013). Because teachers will look to administrators for consent and encouragement to try out the substantial pedagogical and logistical shifts required, the success of the new standards depends on the expertise and support of administrators.

Adding to the urgency of ensuring that administrators support NGSS implementation is the fact that the California Science Test (CAST), based on the NGSS, became fully operational in the 2018–19 school year. Administered in grades 5, 8, and high school, the CAST assesses cumulative learning up to a student's current grade (as opposed to only testing content from a student's current academic year). CAST results will be reported on each school's School Accountability Report Card beginning in 2020. The State Board of Education has determined that the results will be displayed alongside results for Common Core subjects on the California School Dashboard when an appropriate mechanism for integrating them into the accountability structure is determined (California Department of Education, 2016; 2019a).

Like teachers, administrators need opportunities for professional learning to understand and begin to implement the NGSS. To help them lead their schools and districts in enacting the necessary shifts, the NGSS Early Implementers Initiative enlisted and empowered administrators in the Initiative from the outset.[1] However, over time, the Initiative has seen that the roles administrators play in NGSS implementation are more than just helpful — they are crucial. Correspondingly, each year, the Early Implementer districts have expanded opportunities for administrator professional learning.

> For myself, digging deeper into what the expectations are of NGSS has worked wonders for me. Now seeing it play out in the classrooms — how engaged students are — has sold me on how important science is. (Elementary school principal)

This report — intended for school and district administrators, leaders of science professional learning, and state policymakers — discusses the following:

- The professional learning strategies used by the Initiative to engage and empower administrators to support NGSS implementation
- The impact of the professional learning on administrators' understanding and actions
- The challenges experienced by the Initiative in trying to involve administrators
- Recommendations for increasing help to administrators with science implementation

1 Similarly, other projects supporting implementation of the NGSS are recognizing the significant role that administrators play (for example, see Hayes, Heredia, Allen, Settlage, & Penuel, 2017; Kern, Bozack, & Whelan, 2017; Riedinger, 2017; Sandoval, Cournoyer, Eggleston, Modrek, & Kawasaki, 2017; and Vallett, Deniz, Carroll, Sibley, & Gilligan, 2017).

This report's findings are based on an extensive amount of primary data: evaluators' observations of professional learning specifically for administrators, as well as professional learning for teachers that administrators attended; data from a dozen surveys; and over 100 interviews with teachers, administrators, district Project Directors, and K–12 Alliance Regional Directors. Secondary data sources that were reviewed include participating districts' annual grant reports and Local Control Accountability Plans.

Context

Before turning to the report's findings, we first describe three pieces of context to help readers better understand the evaluation's findings.

1. Student Engagement and Learning in NGSS Prompt Administrator Interest

One of the fundamental reasons that administrators are actively supporting the NGSS is that they have seen firsthand and heard from their teachers that effective NGSS teaching is making a strong difference for students' engagement and learning. The following quotes illustrate the enthusiasm that administrators have about this student engagement.[2]

> *Students have deeper interest in wanting to pursue STEM outcomes and high interest in those after-school activities like science club, computer coding, all kinds of animation, and mechanical engineering. We have 20 high-interest after-school clubs. The families work kids' schedules so that they can attend! All that is connected to the Early Implementers Initiative. (Core Administrator elementary principal)*

> *Students are collaborating more and refining their thinking; they know how to cite evidence. They know it's ok that their answer isn't always right. We've changed the student mindset on that as well. We call that whole process "the power of YET": "I didn't get it yet." (Core Administrator elementary principal)*

> *They love it. They love any time that they're doing any type of science, that's the best part of their day. And I know some teachers have adjusted their schedules where they make science day like a Wednesday or a Friday and they make it a longer extension, so they have more time to actually do some labs and some cool things with the kids. And they're finding the kids who are the quiet kids or even the kids who get in trouble, they're better on science days. The teachers even have fun with it. (Elementary school principal)*

> *[NGSS science] has made it more student-centered. Students are driving more of the learning. Their wonderings and their inquiry are more central to the structure of learning opportunities for students. (Elementary school principal)*

2 For more on the impact of the NGSS on students, see evaluation report #6, *Engaged and Learning Science: How Students Benefit from Next Generation Science Standards Teaching:* https://wested.org/resources/engaged-and-learning-science/

2. A *Model for Implementation of Standards in Other School Subjects*

During interviews with administrators, evaluators asked, "Can you compare what was done with and for administrators about implementing the NGSS with what you experienced for English language arts (ELA) or math in the Common Core State Standards (CCSS)? Since the CCSS were about required school subjects having strong accountability in testing, did administrators receive a range of robust professional learning and support?" Some administrators responded that the NGSS Early Implementers model for involving administrators, as described in this report, could be seen as a model for involving administrators in the implementation of standards in other school subjects.

Administrators generally replied that they received less professional learning and support for implementing the CCSS, and that it was often narrower in scope and less effective, as illustrated by this response from a middle school principal:

> *Oh my gosh, the Common Core effort doesn't compare. For example, we just did a math adoption. There was one full day of administrator training just so they could understand the curriculum's structure. Unlike the NGSS administrator sessions . . . it wasn't content, it wasn't conceptual flow, it wasn't about developmentally appropriate, it wasn't about application. We've had one more day [of the administrator math training] since then. But as far as really diving in and understanding the pedagogy behind it or the research, or the content . . . that didn't happen. I will tell you that there's some administrators who still don't understand Common Core.*

3. *Overview of District Participants in the Initiative*

The last piece of context we provide is an overview of key Initiative participants who are featured in this report. The Initiative created an organizational structure to support NGSS implementation in participating districts at multiple levels — from teachers to site administrators to district leaders (see Figure 1).[3]

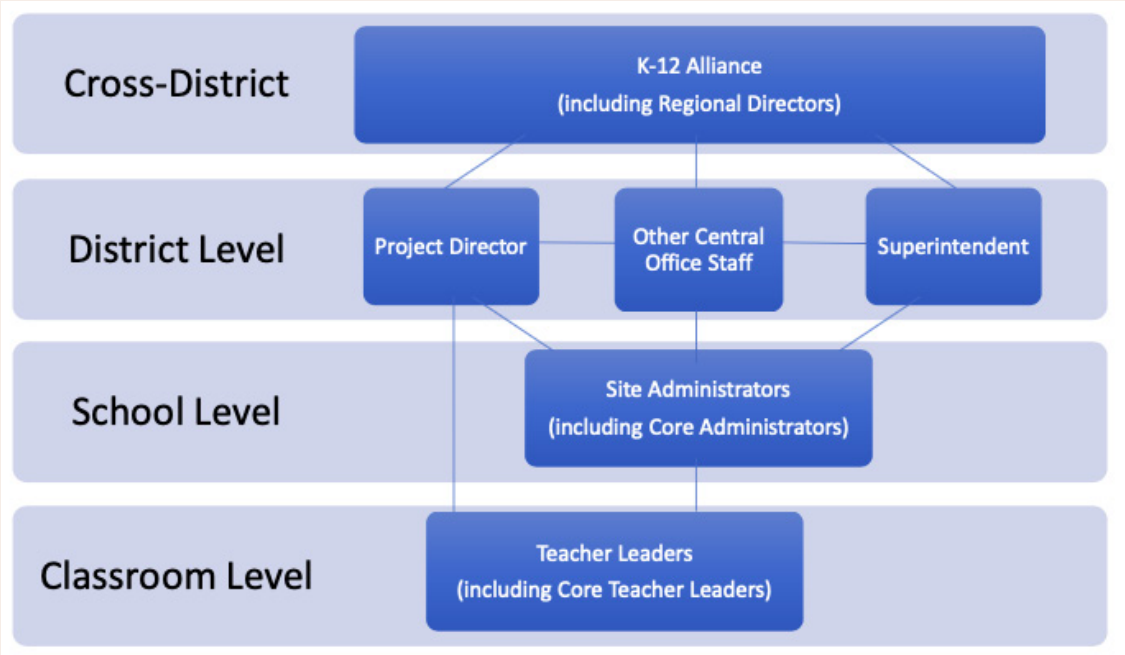
Each Early Implementer district has a Core Leadership Team, which includes five to ten teachers at multiple grade levels in primary, upper elementary, and middle school (called the Core Teacher Leaders) and three to five administrators (called the Core Administrators). The Core Administrators typically include site administrators at both the elementary and middle school levels, and sometimes include central office staff. Each district's Core Leadership Team works with that respective district's Project Director in planning and carrying out NGSS implementation in the district, including its sustainability.

The following briefly describes the roles of the three key Initiative players featured in this report:

- **District Administrators.** The report briefly describes how the Initiative has engaged administrators at the district level, including superintendents, assistant superintendents for curriculum and instruction, and a variety of other roles.

3 In Achieve's *NGSS District Implementation Indicators* (2017), they indicated, "Essential to the transition [to the NGSS] is a central office leadership team coupled with site-based leadership . . . [and] education professionals" that together have a set of skills that facilitate successful implementation of the NGSS (p. 6). Additionally, researchers have found that administrators play an important role in science (Brunsell, Kneser, & Niemi, 2014) and teacher leadership in general (York-Barr & Duke, 2004).

Figure 1. Diagram of Early Implementers Initiative district organizational structure



- **Site Administrators.** The report focuses most extensively on principals and assistant principals at both the elementary and middle school levels who have at least one Teacher Leader at their site. This group includes site leaders on the Core Leadership Team (Core Administrators).
- **Teacher Leaders.**[4] All teachers who participate in substantial Initiative events are referred to collectively as Teacher Leaders. This group of over 500 includes the Core Teacher Leaders on the Core Leadership Team. In this report, Teacher Leaders were asked to comment on and describe their administrators' efforts to support them. This report reflects feedback from this group on support for NGSS teaching that administrators have provided.

4 For more information about Science Teacher Leaders, see evaluation report #7, *Investing in Science Teacher Leadership: Strategies and Impacts in the NGSS Early Implementers Initiative.*

How the Initiative Contributed to Administrator Understanding of the NGSS

The Initiative first provided professional learning for the Core Administrators. In Year 2, Initiative leaders were struck by several Teacher Leaders' comments that they were reluctant to implement what they had learned in the summer professional learning out of concerns for their administrators' reactions. One of the K–12 Alliance's Regional Directors described the Initiative leadership's reaction: "Oh my goodness. If we don't truly involve administrators more than projects usually do, there is no way we're going to be able to be successful with the Initiative's mandate to spread NGSS teaching from the Teacher Leaders to all teachers."

Initiative leaders immediately worked on a substantial response. They began to plan a range of professional learning opportunities (later referred to as the Principal Academy) specifically to engage site administrators and empower them to support NGSS implementation. The Initiative has looked to site administrators to support teachers who are implementing the NGSS in their classrooms. Consequently, professional learning for site administrators has focused on not just the structure of the standards, but also on the substantial pedagogical shifts required to teach and implement within sites and across districts. Additionally, the Initiative annually convened a Superintendents' Roundtable to engage the superintendents and assistant superintendents in the Initiative and encourage them to convey expectations for the administrators in their districts to pay informed attention to NGSS implementation.

Leadership Growth: Professional Learning for Core Administrators

Administrators on the Core Leadership Team received the following professional learning on an annual basis, led by the K–12 Alliance:

Summer Institutes. These regionally located events kicked off each of the first four years of the Initiative with a week of NGSS-aligned pedagogy and adult-level science content sessions for Teacher Leaders. Core Administrators also attended to participate in district team meetings and to support teachers who were receiving and/or delivering professional learning. During the final two days of the week, Core Administrators presented to other principals in attendance. Beginning in Year 5, when districts held their own Summer Institutes, Core Administrators played a similar role.

Biannual Leadership Trainings. Every January and June, the Core Leadership Teams convened for three to four days of focused leadership training and planning activities. Core Administrators

attended general sessions as well as ones geared to their specific needs and interests.

Cultivating Support: Principal Academy for Site Administrators

As mentioned above, the K–12 Alliance discovered early on that, in the absence of explicit "permission" from their administrators, some Teacher Leaders were unwilling to experiment with the NGSS in their classrooms. In 2017, 57 percent of Teacher Leaders indicated that administrators allowing them the "flexibility to try new things" was a major factor that supported their implementation of the NGSS. As one middle school teacher noted, administrators need to understand that implementing the NGSS in the classroom "can look like controlled chaos!" A school administrator similarly described the need to allow teachers room to take risks:

> *As an administrator, I know that this is the biggest fear of teachers. They're thinking, "If my principal walks in and the kids are giving these crazy answers that are not right, then what will happen?" My teachers know it's okay to take risks, it's okay to fail, it's all part of the process of being a good science student or a scientist. (Middle school principal)*

A grade 6 teacher explained the value of allowing teachers to experiment:

> *My principal doesn't give you the feeling when she walks into your classroom that she is expecting to see a certain thing or that students need to be sitting this way or writing notes like this. NGSS is a little messy and she understands that and knows that kids are going to be all over the place and their notebooks are sometimes a disaster. We're all learning together and sometimes we fail . . . She kind of gives us the freedom to do that. (Grade 6 teacher)*

To address the lack of understanding about the NGSS on the part of these influential site leaders, K–12 Alliance Regional Directors and district Project Directors planned a Principal Academy for principals, vice principals, and other administrators whose schools had at least one Teacher Leader. The Principal Academy was initiated in Year 2 with a single day at the Summer Institute and was expanded in Years 3 and 4 to two days at the Initiative's Summer Institutes, followed during the school year with three days of support through a variety of means. In Year 5, when districts took over primary responsibility for planning and providing professional learning activities for their own personnel, most continued to use and adapt the Principal Academy tools and practices, described below.

Participating in Tailored Summer Institute Sessions

Beginning in Year 2 of the initiative (2015–16), districts arranged for their elementary and middle school administrators to participate in the annual project-wide Summer Institutes. One day was spent in the same sessions as the Teacher Leaders. In addition, a full-day program of sessions for administrators was instituted. In these sessions, principals learned and talked with their peers about the pedagogical shifts of the NGSS and how to support the NGSS in their schools and districts.

Academy sessions such as the following were offered:

- Ensuring equity and access to quality science instruction for all students
- Linking science assessment and instructional strategies
- Identifying characteristics of an NGSS classroom
- Implementing the NGSS at the middle school
- Supporting NGSS and CCSS integration
- Building a culture of change and innovation
- Supporting science as a core subject

Observing a Teaching Learning Collaborative

Site leaders who had Teacher Leaders at their school were invited to spend three more days in NGSS professional learning in their districts over the course of the following school year. All were encouraged to spend one of those days sitting in on a Teaching Learning Collaborative (TLC),[5] which is the Early Implementers Initiative's lesson study that brings together same-grade teachers, typically from different schools within the district. With an Initiative-trained facilitator, teachers in a TLC spend one day planning an NGSS-aligned lesson and another day co-teaching, debriefing using student work, revising, and re-reaching it. Administrators usually attend the teaching day because they can see how students react to the lesson and they can listen to the debrief after each lesson is taught. Many administrators have reported finding strong value in hearing the debrief conversations held by teachers after each lesson is collaboratively taught. Some have been impressed with the depth of teacher analyses and insights revealed in these conversations.

Using the Evidence of Learning Protocol to Observe Science Lessons

The Early Implementers Initiative leaders also developed an Evidence of Learning Protocol, originally designed for principals when observing TLC lessons and later used, in some districts, during the more widely implemented science walk-throughs (described below). The protocol is a collaborative tool designed to facilitate communication between a principal and a teacher about observed NGSS instruction at three intervals over time: (a) how the learning is planned, (b) how the learning is enacted during the lesson, and (c) how the learning is assessed through student work. Prior to the observation, the principal discusses the lesson plan with the teacher. The tool prompts them to discuss the following:

- The use of a phenomenon[6] to engage students and drive their investigations and learning
- How students' critical thinking skills are prompted so that they may possibly revise their understanding of the phenomenon
- Which CCSS-ELA or CCSS-mathematics standards the learning sequence addresses and how students integrate or use the CCSS to deepen their understanding of the phenomenon

The ultimate goal of the Evidence of Learning Protocol is to share the vision of NGSS instruction

5 For more information about the TLC, see evaluation report #8, *Collaborative Lesson Studies: Powerful Professional Learning for Implementing the Next Generation Science Standards:* https://www.wested.org/resources/powerful-professional-learning-for-implementing-the-next-generation-science-standards/

6 Natural phenomena are observable events that occur in the universe and that we can use our science knowledge to explain or predict. For more information, see: https://www.nextgenscience.org/

so that administrators are better able to support teachers as they implement the new standards.

Conducting Facilitated Science Walk-Throughs

By Year 4, most districts were implementing science walk-throughs (also called "learning walks"). Science walk-throughs occur at individual school sites and in a variety of classrooms. Regional Directors, as well as either Project Directors, Core Administrators, and/or Core Teacher Leaders, accompany site administrators during the walk-throughs. The group discusses their observations in order to both help site administrators understand NGSS instruction and profile the school's progress toward the instructional shifts required by the NGSS. As mentioned above, some districts used the Evidence of Learning Protocol during the walk-throughs, but over time many districts adopted a more streamlined tool, called the Science Walk-Through Tool (see Appendix A).[7] The incidence of science walk-throughs increased over the course of the Initiative. By 2018–19, 86 percent of administrators participated in at least one walk-through, and almost a fifth of them participated in six or more.

It was recommended that the remaining days of each administrator's Principal Academy be spent on other NGSS-related activities, such as:

- Attending a district professional learning day for teachers
- Seeking assistance from a mentor on the Core Leadership Team on a specific issue
- Collaborating on a site plan for NGSS implementation with a designated Site Teacher Leader

The overarching goal of such intensive engagement by these site leaders is support for Teacher Leaders as they both implement the NGSS in their own classrooms and fulfill their leadership roles by sharing their learning about the NGSS with other teachers in their schools and districts.

> ***They received some of the same Summer Institute sessions that their teacher leaders were receiving. They got to see what the content was that their teachers were learning because part of the Summer Institute was content driven. They got to see their teachers interacting with scientists. They got learning pieces that they could take back and present to their sites. They got to interact with each other and also with the K–12 Alliance team. And they also got taught by their teachers. At the end, teachers had to present sessions to their administrators, and it gave administrators the confidence to know that these Teacher Leaders could come back onto their sites, lead, and present professional development. (Core Administrator elementary principal)***

Making Use of Districts' Regular Administrator Meetings

Core Administrators and Project Directors advocated for the inclusion of science on management meeting agendas. In districts where they succeeded, this proved to be a very effective strategy for bringing site leaders on board with efforts to implement the NGSS districtwide. When

7 For a more thorough discussion of the both Evidence of Learning Protocol and the Walk-Through Tool, see: *Next Generation Science Standards in Practice: Tools and Processes Used by the California NGSS Early Implementers:* https://wested.org/resources/next-generation-science-standards-in-practice/

asked in an interview what has been most effective in convincing administrators in the district to support the NGSS, one Project Director explained the importance of administrator-to-administrator communication:

> *[Core] Administrators, during the admin meetings they have with the superintendent and the curriculum director, they are able to . . . feed in, "Well in science, we are working with Common Core because what we're doing fits right in ... with that and with the math implementation, too."... That conversation is now being heard from other administrators who aren't on our team. I think that has been key to us moving forward. It had to come from administrators to administrators. (District Project Director)*

Just as NGSS implementation was included as a standing agenda item at district management meetings, many principals in turn included it as a standing item at their own school staff meetings.

> *I think just the fact that our principal gave staff meeting time to science, because we don't have a lot of staff meetings in our school, was a big signal and it also helped us understand the NGSS, and she did this for three staff meeting days. (Kindergarten teacher)*

Vignette: A District's Extensive Use of Regular Administrator Meetings

Evaluators observed a management meeting in one district where the Early Implementer Project Director was given 90 minutes of the day's agenda of a regular district administrator meeting. Three Core Teacher Leaders and a K–12 Alliance Regional Director accompanied the Project Director to the meeting. Every principal and vice principal in the district was in attendance, as was the superintendent.

The Project Director began by focusing on student discourse:

- "What are academic discussions and why are they important? Pair up and chat."
- "How can teachers facilitate high-quality academic discussion in the classroom? What is necessary to make academic discussion happen?" Another think-pair-share.

During the share-outs, the superintendent exclaimed, *"These are the kinds of conversations we want them to have in all subjects!"*

Then all the administrators did a short hands-on science investigation, just as the Initiative has teachers do in their professional learning sessions. They were given raisins, carbonated water, and clear plastic cups and asked, "What do you think will happen if we add raisins to fizzy liquid? Fill out this prompt in the notebooks we've passed out: 'I predict _____ because _____. I think _____ because _____.'" After three minutes to write in their notebooks, they dumped soda and raisins in their cups. For five minutes, everyone

observed the raisins in soda. They noticed that some were floating, some were sinking, some were going up and then down. Observations were recorded in notebooks, following prompts on the screen.

Before discussing the investigation, the Project Director asked, "How can you establish conditions for respectful, equitable discourse?" Participants offered many ideas, such as: "Communicate that it's normal to disagree." "Do a fishbowl practice session so kids can see what respectfully disagreeing looks like." "Give each student a white board — every student has to show their ideas before anyone can talk out loud." "When they're interacting, they're putting more into long-term memory."

The Project Director offered, "Give every student a chance to formulate a response first. If I don't have time to think, I don't have anything to say." The Project Director then asked, "And now, what about the raisins? What do you think is happening?"

Someone exclaimed, "They're still dancing!" In groups of three and four, the administrators discussed their ideas for several minutes. The Project Director then asked the Core Teacher Leaders to share their experiences implementing the NGSS. Their comments included the following:

- "I've done a displacement lesson. The math teacher was doing volume, and the kids weren't getting it. So, we did an activity with baseballs in the water. They observed and drew, talked, over multiple days. They had it down. When they took the math test, they talked about science. It was the getting to apply it — not just getting it from a book."
- "I'm in the immersion program, with an [English language development] class. I can incorporate science — I use strategies you saw today to help them with conversing — they can argue respectfully, which was hard at first. Now they know how to give feedback."
- "There's no right answer — just everyone's ideas. So, they're more willing to participate. No fear of being wrong. What's important is that you're thinking."
- "It goes back to how people learn, clarifying misconceptions, everyone is at a different level, but we're all progressing. You hear a lot of 'Oh!'"

An administrator commented, "We'd call that residue — when kids leave the classroom with something — curiosity." The superintendent added, "We sure have some residue over here. Are you *ever* going to explain what's going on with the raisins?" The Project Director answered: "I'll be back in a month!"

The vignette illustrates how much the administrators learned about what Early Implementer teachers were doing in science lessons. The administrators experienced a lesson firsthand and saw how curiosity is engaged and sustained. They gained an understanding of the role of student discourse in a science lesson. They also discussed related issues that apply to any content area, such as what students gain from talking to one another and considerations and strategies for employing student discourse equitably.

Additional District Professional Learning for Administrators

Beyond making use of the regular district meeting time for administrators, a few districts created some additional professional learning opportunities for them about NGSS implementation. For example, one district conducted an ongoing professional learning program over the course of the 2018–19 school year and is adding a little more to it during the 2019–20 school year, as described in the following vignette.

Vignette: A District's Year-long Professional Learning for Administrators

Over the course of the year, all K–8 principals were required to attend a series of three four-hour meetings that were based on a cycle of inquiry model. That is, during the months between these meetings, administrators were asked to try out the introduced strategies and then debrief their experiences and learning at the next session. The purpose of the series was to familiarize the site administrators with the NGSS, the shifts required to teach them, and the links to the CCSS in ELA and math. In attending the second of these sessions, evaluators observed that the administrators were very engaged, and that they had done the homework assigned at the previous meeting.

At the initial principal meeting, the leader presented foundational information about the NGSS, including aspects such as three-dimensional learning, the crosscutting concepts, phenomena, student discourse, the science and engineering practices, and the 5E lesson plans. The principals were then trained on the use of a science walk-through tool by watching videos of science instruction. They also gained a deeper understanding of the NGSS through discussion. The principals were then given an assignment to compete four science observations at their own schools using the walk-through tool. They were also asked to submit data from these observations for the next session by completing a Google Doc for the Project Director.

In the next session, they collaboratively analyzed the compiled observation data, including detecting trends and clarifying understandings. They discussed modifications to the walk-through tool that they thought were warranted and reviewed the data collected by the Project Director. They saw certain patterns in teaching strategies across all teachers in the district and distinguished the characteristics of certain groups of teachers within their schools and across the district as a whole, particularly patterns related to those teachers with training on the NGSS through the Initiative versus those without. The administrators were curious about the role phenomena played in NGSS lessons and, as a group, decided that this was something they wanted to explicitly focus on in the next round of walkthrough observations and data collection.

Each subsequent session followed a similar practice of analyzing compiled results and trends. Principals referenced their observations and related them to their understanding of NGSS instruction. Subsequent cycles of inquiry focused on student discourse, sense-making, and 5E lesson plans.

As administrators became comfortable with what NGSS science teaching and learning should look like in the classroom, they became adept at understanding student progress through the grade bands and at making connections with Common Core ELA and math standards. The gains from this deeply collaborative training model were so valued by participants and the district office that a second series was planned for the next year. That series will include a focus on equity, NGSS and CCSS math connections, CAST results review and support, and adopted curriculum overview. The district office also embraced the professional development model for use with the district science coaches and planned to expand it for district-wide use in other content areas.

Reaching the Top: Superintendents Roundtable

The Initiative instituted an annual Superintendents Roundtable to make direct contact with these influential district leaders. The roundtables brought together the superintendents, district Project Directors, K–12 Alliance Regional Directors, and sometimes additional district-level personnel from all of the districts participating in the Initiative, with the goal of fostering increased involvement and support from upper levels of district administration. Although these meetings were only five hours, including a lunch break, their agendas included substantial time (about two hours) to exchange ideas across districts and with Initiative leadership. Each year at the Roundtable, an evaluator presented key findings relating to the main day's agenda.

These meetings provided an opportunity for superintendents to recommit to prioritizing science as a core subject and implementing NGSS in their districts. Superintendents were asked to prepare for the meeting in advance by answering a few questions in writing, in collaboration with their district Project Director. The Project Directors reported that this helped them leverage their superintendents' focus on NGSS implementation in the face of the extreme range of matters that vie for their attention.

Focus topics in these Roundtables have included:

- Equity and importance of access to science in elementary schools
- Engaging and enabling principals and administrators
- Engaging, equipping, and empowering all teachers
- Using learnings from the Initiative for scaling up and sustainability

Impact of Administrator Professional Learning Experiences

Evaluators have heard from participants at all levels — from teachers to Project Directors — that the more administrators learn about the NGSS, the more willing they are to support their implementation.

> *We talk a lot about how the teachers are doing things in their TLCs. By having teachers on all sites, we can say to them, "Go back and talk to your principal about what you just did at the TLC," if the principals hadn't come to it. I had a middle school principal come up to me at that last meeting I was at and say, "I want to use this model for other things I'm doing at my school." Because she saw how excited her teachers were to give up time to get together and collaborate and all of the rest of it. So, some of this stuff is selling itself. It's just getting them exposed to it. (Project Director)*

Increased Administrator Understanding of the NGSS

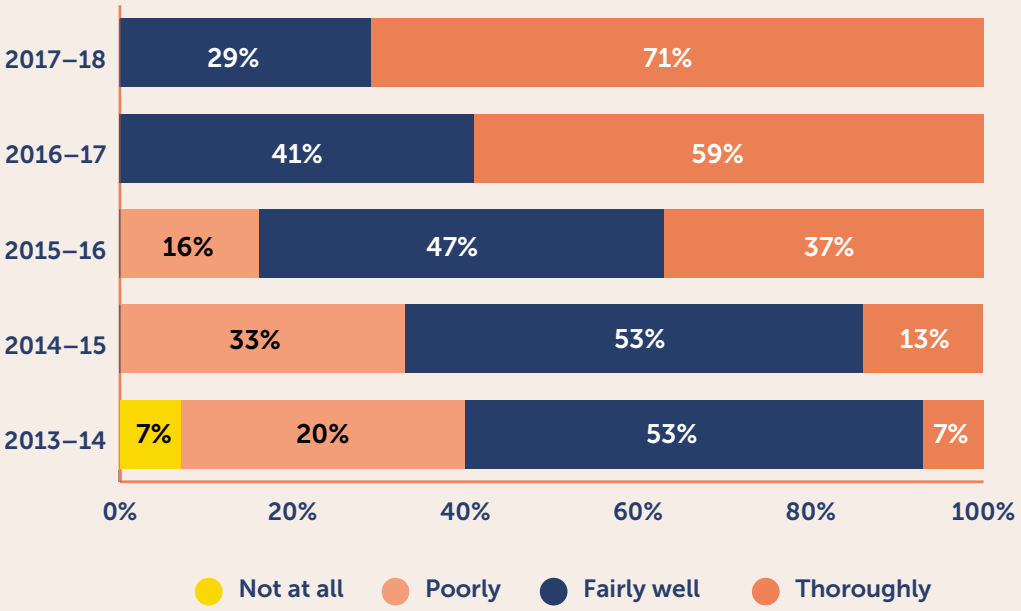
Core Administrator Understanding of the NGSS

Structure of the NGSS. Administrators grew in their understanding of the structure of the NGSS substantially over five years, as shown in Figure 2. In 2013–14, 53 percent of respondents reported that they understood the NGSS structure "fairly well," while none reported understanding it "thoroughly." In 2017–18, 29 percent reported understanding the structure of the standards "fairly well" and 71 percent reported understanding it "thoroughly."

Shifts in pedagogy required to teach the NGSS. Over five years, Core Administrators reported an increase in understanding about the shifts in pedagogy required to teach the NGSS. When asked in 2013–14 about their understanding, 60 percent of respondents reported that they understood these shifts "fairly well" or "thoroughly." By 2016–17, 100 percent of respondents said they understood the shifts "fairly well" or "thoroughly."

Figure 2. Core Administrator understanding of the structure of the NGSS over five years

How well would you say you understand the structure of the NGSS (the three dimensions)?



Source: Administrator Leadership Survey, administered in winter 2015 (retrospective baseline data for 2013–14, N=15), and spring 2015 (N=16), 2016 (N=19), 2017 (N=29), and 2018 (N=31).

It [NGSS] looks different, it sounds different, and it feels different and you know it as an administrator when you walk into a classroom. . . . Kids' conversation is different, how they go about solving a problem is different, the information they're given is different. The format and the days of lecture and then prove the teacher correct by doing a demo or a lab and then show that you have learned everything by an assessment — those days are long gone and I'm very happy about that. (Core Administrator middle school principal)

How the NGSS relate to the Common Core State Standards.[8] Prior to the Initiative (in 2013–14), when asked to what extent they understood how the NGSS relate to the CCSS, 100 percent of Core Administrators responded "not at all." By 2015–16, 90 percent of Core Administrators responded "fairly well" or "thoroughly" to the same question.

[Site administrators'] eyes are open to the integration piece. I think that that's been the big "aha" for [site administrators]: "I can get more bang for my buck by pushing science than I can by just pushing reading and math and English — I can get more for it." I think now they actually are seeing that "I can get more if I push social

8 For more information about how the NGSS complement the CCSS-ELA, see evaluation report #2: *The Synergy of Science and English Language Arts: Means and Mutual Benefits of Integration:* https://www.wested.org/resources/synergy-of-science-and-english-language-arts/

> *science too." They're starting to realize the integration piece and they're seeing the ways that integration is a lot of different subjects, not just in science. (District administrator)*

The scope of transitioning to the NGSS. From 2013–14 to 2015–16, the percentage of Core Administrators reporting that they understood the scope of transitioning to the NGSS "fairly well" or "thoroughly" increased 27 percentage points (from 53 percent to 80 percent).

How to help teachers transition to the NGSS. From 2013–14 to 2016–17, there was an increase of 53 percentage points in the Core Administrators who reported understanding how to help teachers transition to the NGSS "fairly well" or "thoroughly" (from 47 percent to 100 percent).

Site Administrator Understanding of the NGSS

Survey results show improvement in site administrators' understanding of the NGSS between 2017–18 and 2018–19, the years when the evaluation team began to survey principals who were not on the Core Leadership Team.

The shifts in pedagogy required to teach the NGSS. As with Core Administrators, principals reported growth in understanding the shifts in pedagogy required to teach the NGSS. After the 2017–18 school year, a combined 75 percent reported understanding the shifts "fairly well" (70 percent) or "thoroughly" (5 percent). After the 2018–19 school year, the combined percentage increased by 11 percentage points.

How to help teachers implement the NGSS. Over the mere one year between these survey administrations, principals reported an increase in understanding of how to help teachers implement the NGSS. After the 2017–18 school year, 59 percent of principals reported understanding how to help teachers implement the NGSS "fairly well" or "thoroughly," whereas after the 2018–19 school year, 68 percent reported so. While the principals' increase of nine percentage points is lower than the Core Administrators' increase of 53 percentage points (as reported above), it should be noted that non-Core Administrators had only participated in two years of Initiative activities, as opposed to the five years of Core Administrator participation.

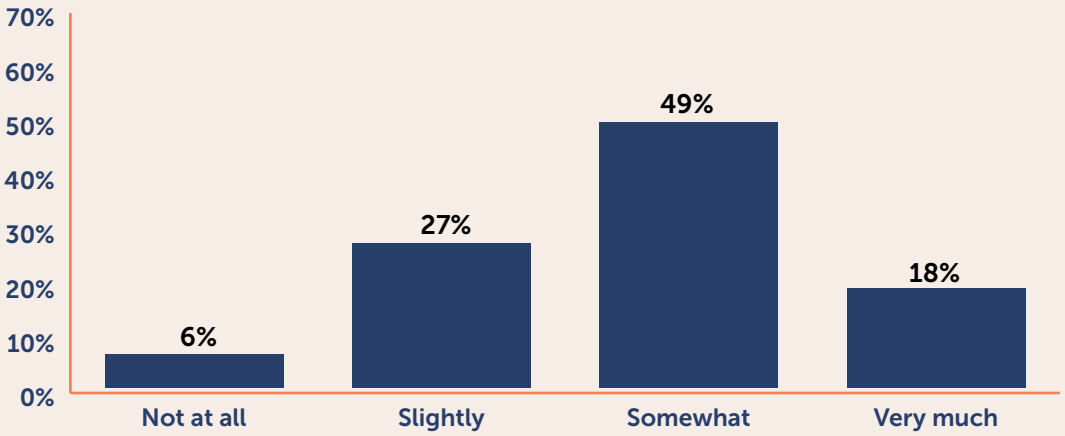
Increased Administrator Support of Teachers Teaching the NGSS

Survey results also show that as principal understanding of how to support teachers has grown, principals' behavior on the job has followed suit. In the spring of 2019, principals were asked how much they supported teachers in teaching the NGSS last year, and whether they had provided more or less support this year than in the prior school year. Figure 3 shows that over three quarters of respondents said they supported teachers "somewhat" or "very much" in 2017–18. Figure 4 shows that 59 percent of principals said that they had increased the level of support for teachers teaching the NGSS in 2018–19.

In 2017–18, 47 percent of Teacher Leaders reported that their administrators enabled teacher collaboration on science. This increased to 62 percent in 2018–19.

Figure 3. Principal support of teachers teaching the NGSS, 2017–18

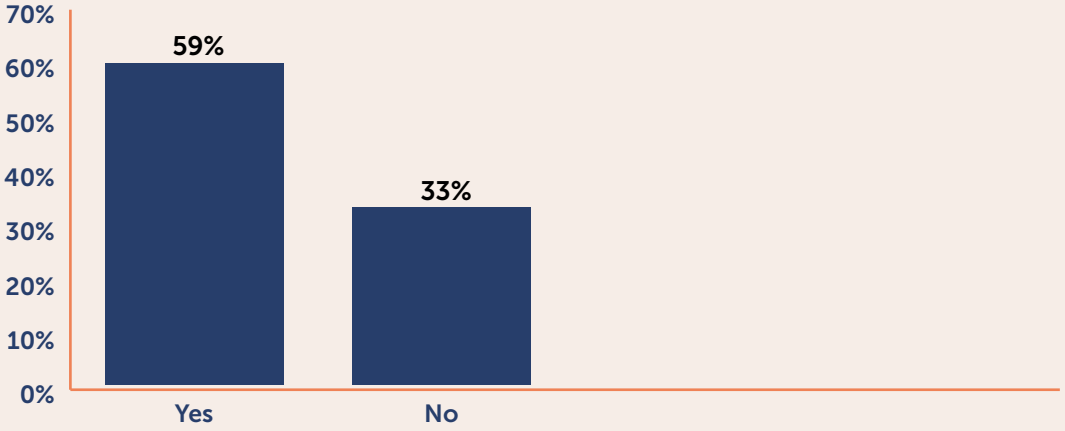
How much did you support teachers in teaching the NGSS last year (2017–18)?



Source: Principal Survey (N=49), administered by WestEd in spring 2019.

Figure 4. Principal support of teachers teaching the NGSS in 2018–19 compared to 2017–18

Did you support teachers in teaching the NGSS notably more this year (2018–19) compared to last year (2017–18)?



Source: Principal Survey (N=49), administered by WestEd in spring 2019.

Note: Eight percent chose "Other" instead of yes or no, for a variety of reasons.

Principals who had responded that their support had increased were also asked in the survey, "Please identify up to FOUR of the strongest reasons you supported teachers in teaching the NGSS more this year (2018–19) compared to last year (2017–18)." Over two-thirds (68 percent) of respondents chose "Understanding of the Next Generation Science Standards (NGSS)." The second most popular answer choice (46 percent) was "Opportunity to collaborate with teachers."

Supplies for Science

A practical and important way that administrators helped teachers implement the NGSS is by ensuring they have access to supplies and materials needed to deliver NGSS instruction, which heavily emphasizes student investigations, most often including hands-on activities. In interviews, administrators reported that they used a wide variety of funds — such as Local Control and Accountability Plan (LCAP) funds, lottery, petty cash, and donations from parent organizations, educational foundations, and local grants — to ensure the availability of instructional materials and supplies.

> *As principal, I can ensure funds are channeled to provide the resources that support the specific science standards that hinge on them, such as online access, the availability of digital devices such as Chromebooks, and a generous selection of library texts. (Elementary school principal)*

One principal, recognizing the potentially limiting influence that a perceived lack of supplies could cause, utilized her school's associated student body (ASB) fund to support NGSS instruction:

> *We have an associated student body with a student body account and sometimes teachers need supplies on the fly, things you can't get the hard way through the district. I feel that ASB is by the students for the students. If they need, say, pipe cleaners or apples or something for a science activity right then, I've set up in our ASB an account that has just a couple hundred dollars. Then the teachers can get reimbursed for those disposable, reusable things that they need. For them, just knowing that's there even if they don't seek reimbursement, I think that kind of gives them the freedom to know that they can do those [science] activities. It takes those barriers away. (Core Administrator elementary principal)*

Collaboration Time for Teachers

Another vital support provided by administrators was to provide additional time for teachers to collaboratively plan lessons and score student work. At some school sites, teacher release time was supported by Title I funds, while others used Title II and local grants to support this teacher training and professional development.

> *We wrote it into our school plan that every four weeks teachers have substitutes that come into their classrooms and release them for half a day in order to allow the teacher to have that additional time to collaborate. That's on top of their early release Wednesdays. We just wanted to give them additional collaboration time, because I'm a huge believer in that. We made sure that some of those three-hour blocks were used just for NGSS purposes. (Elementary school principal)*

> *We've been giving teachers extra paid time on the weekends, or planning time after school to come up with storylines, to look at the Framework, and study it for themselves before they even plan units.*

And I think that has been crucial — for them to have time to bounce ideas off of each other, to think about, "Well, if this is what our lessons and units look like, then how are we assessing students? How do we know what they understand?" (Middle school principal)

In surveys, Teacher Leaders were asked how supportive their principals were of them teaching NGSS science. Over two thirds (67 percent) reported in 2019 that their principals were "Very" supportive, a slight increase from 2017 (64 percent). The percentage of teachers who said their principals were "Not at all supportive" was only 2–3 percent in the three annual survey administrations. Teachers were also asked to identify from a provided list the specific things their principals did to support their teaching of NGSS science. The most common choices in both 2017–18 and 2018–19 were "Supports new approaches to teaching science," "Supports integrating science with other subjects," and "Enables teacher collaboration on science," with this last choice moving from third place in 2017–18 to first place in 2018–19.

An explicit strategy of the Initiative was to support teacher leadership in implementing NGSS in their schools and districts. The success of this strategy depended upon administrator support.[9] Principals allowed or invited Teacher Leaders to organize professional development, plan and lead science nights, coordinate science fairs, and share knowledge of the NGSS and lesson plans with teachers during their professional learning communities.

Teachers sometimes relate better to new information when it comes from a fellow teacher versus an administrator. It doesn't seem top-down, and the biggest benefit is that sometimes there is more buy-in from teachers with another teacher being the leader to help support it. (Elementary school principal)

The important thing is the shared leadership part — having teachers work together and assist in the change process is the only way the culture will change. (Core Administrator elementary principal)

Administrators Make Science a Core Subject

With the focus on ELA and math in the California state tests over the past several years, science has widely been considered a lower instructional priority, particularly in elementary schools. To address this issue, Early Implementer districts were required to make science a core subject, on par with ELA and math, as a condition of participation in the Initiative. Consequently, a goal of Early Implementer professional learning for administrators was to communicate this expectation to them and persuade them to support NGSS instruction and communicate to their staffs that science instruction is important. Indeed, over the course of the Initiative, evaluators saw increasing administrator expectations that science be a core subject and advocacy for implementation of the NGSS.

9 For more on the Initiative's support of teacher leadership, see evaluation report #7, *Investing in Science Teacher Leadership: Strategies and Impacts in the NGSS Early Implementers Initiative:* https://www.wested.org/resources/investing-in-science-teacher-leadership-ngss-early-implementers/

As an administrator, you're the leader so it's kind of that trickledown effect. If it's important to you, if you value it, if you make it "living" in your schoolhouse, I think it will be that to the staff as well. The leader has to embrace it and make it living in their school building. (Core Administrator elementary principal)

Local Control Accountability Plans

California's LCAP process results in a three-year plan that describes a district's goals, actions, services, and expenditures to support positive student outcomes that address state and local priorities (State of California, 2019). Six of the eight Early Implementer districts included science in their LCAPs to some degree. Three districts' LCAPs had exclusive goals dedicated to STEAM and science instruction, while another listed science as a core subject along with ELA and math. Other districts included science as a metric or action in support of an overarching LCAP goal. Whatever the method, inclusion of science in district LCAPs helped to communicate to all stakeholders that NGSS instruction was a priority.

District-Mandated Minimum Instructional Minutes

Although the State of California does not mandate a minimum number of science instructional minutes, several Early Implementer Districts have established their own minimum science minutes per week. One district's school board passed a board policy for elementary instructional minutes, while other districts directed expectations less formally. The total weekly minutes of mandated science instruction ranged considerably across the districts — six districts ranged from 60 minutes per week to 270 minutes per week at the K–5 level. In two districts, the amount of science taught was determined at the discretion of the school site. One district reported phasing in an increased number of science minutes over a two-year period.

Strategic Partnerships

Initiative leaders have recognized the importance of building supports from and connections to parents and the community at large. Administrators can sometimes more readily or effectively than teachers play a key role in reaching those constituents (Achieve, 2017). Best practice for developing annual Local Control and Accountability Plans and Single Plans for Student Achievement (when required) calls for input from all stakeholders, including parents and community members. Early Implementer administrators skillfully leveraged the responsibility of developing and engaging parents and community partners to support NGSS in meaningful and sometimes novel ways.

Parents

Early Implementer administrators strategically familiarized parents with the NGSS. Without this, parents could be puzzled about what their children tell them about their science instruction, because NGSS instruction is a substantial shift from past science instruction. This outreach not only prevented parent resistance, but in fact often helped convert parents into advocates for NGSS science.

For example, several districts reported holding family science nights as a natural extension of their parent and family engagement programming:

> *There were stations where families could look at a [science] standard and create something, do an experiment or engineer something. We tried to make it so that it was not just giving them information but having them do something with it. (Core Administrator elementary principal)*

Early Implementer administrators reported increased volunteer parent engagement, varying from photocopying science materials to donating easily obtainable instructional materials such as marbles.

> *[The] community then knows what to expect. Being very transparent about what we are supposed to be teaching and what the standards are gives them the power to be able to say 'Whoa, I know this NGSS thing.' They know what their child should be, and has the right to be, learning and what those standards look like. It's empowering to parents and gives them a voice. There's a role for everyone. We actually had a parent come in with a bag full of cereal boxes and milk cartons and stuff and put them in the box and she was in tears. And we said, 'What's wrong?' And this mom said 'I live in the shelter. It's the first time I've ever been able to donate something to my child's school.' (Core Administrator elementary principal)*

Community

One type of community partnership evolved between school districts and local institutions of higher education. Because NGSS implementation can reveal gaps in teachers' science knowledge, some administrators in the Initiative reached out to local universities for subject-area support for their teachers. For example, administrators leveraged university and college connections to bring scientists onto campus and to arrange field trips for students to visit universities.

Other community partnerships connected local businesses to NGSS instruction. One rural district built a farmyard and life science learning center through a partnership with a local agriculture supply company that donated chickens and chicken feed. In an urban district, a donation from a local concrete company supported student inquiry about material selection for skateparks and sidewalks in community recreational spaces. In another district, the presence of many science-based job sectors in the area helped motivate principals and teachers to embrace the NGSS shifts.

Challenges

In addition to the positive results reported throughout this report, administrators still face various challenges to supporting implementation of the NGSS, and there is room for more progress.

Making Time for Teacher Collaboration and Planning

A common challenge to implementing NGSS identified by administrators was leading and supporting teachers to accomplish such large shifts in practice with limited amounts of time.

> *The biggest challenge we have is just time. It's our most precious commodity, and as a result, teachers are slow to give it up. I think they're fearful about even trying to do things differently, to make the shift. It's a big change in pedagogy, and I think that that's just hard to convince teachers that one, it's doable, and two, it's beneficial to all. Because it's different, I think they just see it as potentially more work. (Core Administrator elementary principal)*

> *The biggest challenge I think is deepening their content, understanding of science, with the time that we have. (Core Administrator elementary principal)*

Funding

As described above, Early Implementer principals reported leveraging a variety of funding sources to ensure that teachers had the materials, supplies, and equipment needed to deliver NGSS instruction. However, funding was also cited as a significant challenge in several districts. Two districts are facing declining enrollment, which has potential impact not only for NGSS instruction but for all aspects of district finance. One district administrator related concerns about having difficulty funding NGSS professional development to sustain the momentum of NGSS implementation gained during the Initiative.

> *One of the greatest barriers that we have thus far is having earmarked dollars for professional learning that's sustainable and ongoing. (District administrator)*

Another director expressed concern about funding sources for science:

> *Science is still viewed as a special program that should be funded by outsiders. (District administrator)*

Staffing

Changes in staffing are a perennial problem facing public schools. One middle school principal described having an entirely new science department that was also new to the profession. Another

principal reported a 40 percent turnover rate in science teachers, which impacted the school's capacity to implement the NGSS because professional development had to backtrack and, in some cases, start over.

> *They need to keep going with the professional development. We have staff turnover. I have a very high staff turnover here so I think the more we can keep professional development going and continue to push those who are doing it to the next level and keep helping the people who are new is the best. (Core Administrator elementary principal)*

Similarly, administrator turnover presented a challenge to NGSS implementation across the Initiative. Several districts experienced changes in superintendent leadership, which carried with it the potential for changes in district priorities and in support for principals. Principal turnover was also a challenge to sustaining change momentum:

> *We've got two brand new principals that we feel like we're starting all over with, just like with the teachers I feel like we're starting all over. Because the whole district is only the seven principals, so when you have a third of your team starting all over again, the challenge becomes trying to bring them up to speed. (Core Administrator elementary principal)*

A third staffing challenge to the work of the Initiative was perhaps the most widespread. Substitute teacher shortages made it difficult for teachers to fully participate in NGSS professional learning and eventually required changes in how and when professional learning for teachers was made available.

Instructional Materials

A very common challenge voiced by both administrators and teachers was a lack of science instructional materials that strongly address the NGSS. Now that a state adoption list of science instructional materials exists, administrators may assume that relief on this issue is at hand. Unfortunately, that may not be the case.

Around the state, trainings are being held about how to use a rigorous method and tool[10] when inspecting potential science instructional materials to see the extent to which they truly address the NGSS, including the extent to which the materials build in appropriate instructional methods. The tool is also designed to assist reviewers in determining whether candidate instructional materials meet the specific needs of the district. At least five Early Implementers districts have had their teachers participate in these trainings to date, and have then gone on to use the tool to inspect candidate materials being considered for local adoption.

Many participants have arrived at the conclusion that few or even none of the instructional materials on the state adoption list address the NGSS to the extent they seek. They would prefer waiting for publishers to develop next versions of materials that more strongly reflect the key aspects of the NGSS. In the meantime, they will rely on facilitated teacher groups to create science units or lessons that more deeply fulfill the NGSS intentions.

10 For information on the California NGSS Toolkit, see: https://ccsesa.org/committees/cisc/cisc-public-resources/

An important implication of the delay in finding adequate NGSS instructional materials is that districts should immediately proceed with providing strong professional learning opportunities to improve teachers' understanding and teaching of the NGSS, rather than making acquisition of instructional materials a first or only implementation strategy. The NGSS Early Implementers evaluation team is following this issue closely in the Initiative and will be able to provide more information as part of another report to be released the first half of 2020.

Recommendations

Evaluation findings suggest that when administrators are provided with relevant professional learning and assistance, many will advocate for and actively support their teachers' NGSS implementation. The experience of Early Implementers also indicates that administrators' commitment to supporting NGSS implementation is amplified through observing instruction that is aligned with the new standards. Witnessing the effects of the NGSS on students' engagement and learning can influence how administrators feel about NGSS implementation and their willingness to support it.

Table 1 presents recommendations, informed by the report's findings, for what school and district administrators can do to effectively support NGSS implementation.

Table 1. Recommendations for how site and district administrators can support NGSS implementation

Recommendations	Site administrator	District administrator
Build NGSS professional development into administrators' yearly work calendars.	NA	Yes
Provide administrators with collaborative time to discuss successes and challenges of NGSS implementation.	NA	Yes
Provide school administrators with collaborative classroom observation protocol(s) (not for teacher performance review) that facilitate meaningful discussion between principal and teacher about NGSS science instruction and provide professional development for using them.	NA	Yes
Establish instructional-minute expectations for science instruction that support parity with ELA and mathematics.	NA	Yes
Include NGSS-aligned science instruction and student achievement in annual LCAP plans.	NA	Yes
Participate in science walk-throughs and teaching learning collaboratives (lesson studies).	Yes	NA
Provide time for teachers to collaborate on science.	Yes	NA

Recommendations	Site administrator	District administrator
Support and fund teachers in getting needed hands-on science supplies and equipment.	Yes	Yes
Regularly put science on the agenda for standing district-wide and school-wide meetings.	Yes	Yes
Communicate that science is a core subject and, as such, an instructional priority.	Yes	Yes
Involve Teacher Leaders in NGSS implementation.	Yes	Yes
Explore and implement high-impact ways to include parents and community members in NGSS delivery.	Yes	Yes

NA= Not Applicable

These recommendations, combined with the ideas and examples presented throughout this report, give administrators an initial road map of things to consider for the NGSS implementation journey — a journey to promote better science teaching that provides all students with more engaging and effective science learning opportunities.

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Appendix A. CA NGSS Early Implementers Initiative Science Walk-Through Tool

Early Implementers Walk-Through Tool: SCIENCE Instructional Core

Grade Level: _____ **Walk-Through #** _____

Task: What is the Focus Question?	**Content: What are students learning?**
What question are students trying to answer or what problem are students trying to solve?	What is the content? Is it aligned to grade level 3-dimensional learning?
Teacher: What is the teacher doing?	**Students: What are students doing?**
How is instruction allowing all students to do the thinking and 3-dimensional learning? *(quantitative & qualitative evidence)*	How are students interacting – with each other, the teacher, the task, and the 3 dimensions? *(quantitative & qualitative evidence)*

Developed by Oakland Unified School District in collaboration with NGSS Early Implementers Initiative, 2017.

Glossary

California Science Teachers Association (CSTA) — A non-profit organization dedicated to promoting high-quality science education and representing the interests of science educators at the state policy level. Several Early Implementer leaders have taken roles in CSTA, and many Early Implementer Teacher Leaders have presented at the association's annual California Science Educator Conference.

Conceptual Flow — Tool developed by the K–12 Alliance for mapping the storyline of three-dimensional NGSS instruction. A conceptual flow can be constructed for a six- to eight-week instructional unit or a year-long program, depending on the complexity of the anchoring phenomenon and how many of the grade-level performance expectations are incorporated.

Core Leadership Team (CLT) — Group of 3–5 administrators and 5–9 teachers, distributed across lower elementary, upper elementary, and middle grades, established at each district at the beginning of the Initiative. The CLT meets with their Project Director regularly during each school year to plan and lead all Early Implementers Initiative activities. They meet with their K–12 Alliance Regional Director for six Technical Assistance Days each school year.

Core Teacher Leader (CTL) — Teacher member of the Core Leadership Team. Provides professional learning to Teacher Leaders, other teachers, and/or administrators in their district or at project-wide events such as the Summer Institute.

Crosscutting Concepts (CCCs) — One of the three NGSS dimensions and a way of linking the different domains of science. CCCs include patterns; cause and effect; scale, proportion, and quantity; systems and system models; energy and matter; structure and function; and stability and change.

Dimensions of the NGSS — The NGSS includes three dimensions: Disciplinary Core Ideas (what scientists know), Crosscutting Concepts (how scientists make connections among the sciences and also a lens for observing and understanding the science), and Science and Engineering Practices (what scientists and engineers do, and how scientific knowledge develops).

Disciplinary Core Ideas (DCIs) — One of the three NGSS dimensions. According to National Research Council's Framework for K–12 Science Education, disciplinary core ideas are the important concepts in each of four domains: physical sciences; life sciences; Earth and space sciences; and engineering, technology, and applications of science.

Expansion teacher — Teacher who has not directly received significant professional learning or support from the Initiative but who is benefiting through the shared expertise of those who have. In larger districts, expansion teachers are typically in schools with at least one Teacher Leader.

K–8 NGSS Early Implementers Initiative — Six-year Initiative (summer 2014 to spring 2020) supporting implementation of the NGSS by eight public school districts and two charter management organizations in California. Developed by

the K–12 Alliance at WestEd in collaboration with the California State Board of Education, California Department of Education, and Achieve, the Early Implementers Initiative builds capacity of participating local education agencies to fully implement the NGSS in grades K–8.

The K–12 Alliance — A WestEd program of science education leaders and professional learning providers who plan and deliver all project-wide activities for the Early Implementers Initiative.

Learning Sequence — Three-dimensional (3D) NGSS phenomenon-based instruction lasting several lessons. A learning sequence is based on investigative phenomena and represents part of a conceptual flow for an entire unit of instruction. Learning sequences can be designed using the "5E" instructional model.

Lesson — Three-dimensional (3D) NGSS phenomenon-based instruction lasting for one to a few class periods.

NGSS — A set of K–12 science content standards developed by 26 states to improve science education for all students. They are composed of three dimensions based on the National Research Council's Framework for K–12 Science Education.

Norms — Agreed-upon productive behaviors and mindsets that guide a group when working together.

Phenomena — Natural phenomena are observable events that occur in the universe, cause us to ask questions, and that we can use our science knowledge to explain or predict. Instructionally, there are two types of phenomena, anchoring and investigative.[11]

Project Director — District person responsible for leading all Early Implementers Initiative activities for the district and representing the district at monthly Initiative-wide planning meetings with Regional Directors.

Science and Engineering Practices (SEPs) — One of the three NGSS dimensions, SEPs are the behaviors that scientists engage in as they investigate and build models and theories about the natural world and the key set of engineering practices that engineers use as they design and build models and systems. They include asking questions (for science) and defining problems (for engineering); developing and using models; planning and carrying out investigations; analyzing and interpreting data; using mathematics and computational thinking; constructing explanations (for science) and designing solutions (for engineering); engaging in argument from evidence; and obtaining, evaluating, and communicating information.

Summer Institute — A 3- to 5-day professional learning event held every summer to kick off the new Early Implementer school year held regionally during Years 1 to 4 of the Initiative. Attended by all Initiative participants, some as leaders (Regional Directors, Project Directors, Core Leadership Team members) and others as learners (Teacher Leaders). Beginning in Year 5, districts organized and held their own Summer Institutes.

Teacher Leader (TL) — One of 30–70 teachers in each district who joined the Early Implementers Initiative in Year 2, one year after the Core Teacher Leaders. Teacher Leaders attend annual Summer Institutes and participate in two TLCs each school year (one in the fall and one in the spring) and other district-level professional learning.

11 See: https://www.nextgenscience.org/resources/phenomena

Teaching Learning Collaborative (TLC) — Lesson-study activity of Years 1 to 4 of the Early Implementers Initiative. Each TLC brings together three to four same-grade Early Implementers Initiative teachers from different schools within the district with a trained facilitator. Teachers plan and teach a lesson to a classroom, then debrief the effectiveness of the lesson design using student work. Based on the analysis of that work, the lesson is redesigned and taught to a different classroom, and then participants discuss the effectiveness of the changes to student learning. In Years 1 to 4 of the Initiative, each Teacher Leader participated in two TLCs per year. Districts began making modifications to the TLC design in Year 5 to reduce teacher time out of the classroom, but some returned to the original format in Year 6.

NGSS EARLY IMPLEMENTERS

WestEd

Administrators Matter in NGSS Implementation (2019)

Updated Findings on How School and District Leaders Are Making Science Happen

EVALUATION REPORT 10

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