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Illustrating Improvement

Noteworthy Practices to Inform California's Math and Science Standards Implementation

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Introduction

Since 2015, WestEd has provided research capabilities, technical assistance, and evaluation support for the California Partnership for Math and Science Education (the Partnership), a statewide initiative designed to increase access to high-quality math and science teaching and learning. Through this ongoing work, conducted in partnership with the California County Superintendents Educational Services Association (CCSESA), the California Department of Education (CDE), and the California State Board of Education (SBE), WestEd has supported two communities of practice, one each for math and science, as well as work conducted by teams of education leaders collaborating to support math and science standards implementation and improve education and learning outcomes.

The Partnership has run its communities of practices since 2016, and they focus on helping educators provide high-quality math and science education for all California students. This work is carried out through professional learning that combines a focus on math and science standards with an emphasis on equity, implementation support, and communication.

Meanwhile, regional teams of education leaders have received two rounds of grant funding to plan and pilot standards implementation initiatives. These innovative micro-grants were designed to test the idea that local innovation could be stimulated with relatively modest investments. They offered teams an opportunity to collaborate deeply on regional and county needs related to standards implementation, fashion projects in response to local challenges, and continue to learn from and incorporate their learning to improve and sustain their efforts beyond the grant funding period.

In this report, we share information about select initiatives' current progress and strategies in order to create an opportunity for ongoing conversations about useful practices to support standards

implementation. Specifically, this report focuses on a selection of noteworthy practices and tools crafted by project teams as they planned for and began to implement their second-year plans supported by the Partnership's improvement grants. The noteworthy practices we highlight fall into two categories:

- Those that aim to **help educators understand what effective standards implementation looks like in practice**
- Those that aim to **build system capacity and coherence for educational change and improvement**

Most teams addressed both categories in their project designs, but this report highlights the elements of projects that stand out for how they adapt or develop upon relatively common standards implementation strategies to maximize their utility in the local context. We shine a spotlight on six practices, and the projects that use them in innovative ways, to illustrate the kinds of reflection and planning that teams engaged in and the contextual factors and anticipated benefits that drove the teams to improve, expand, or innovate. Key takeaways are then summarized for these two categories. Ultimately, we share these examples so that educators across the state might consider and reflect on them as they continue their own efforts to find the "right" solutions to support math and science standards implementation and improvement in their own contexts.

How Projects Were Selected for this Report

In total, 19 regional and 5 county project teams were funded to continue their work through April 2020. We selected a small number of initiatives to serve as examples of noteworthy strategies to help local educators implement math and science standards.

The selection process included examining where each project stood with its implementation; interviewing leadership teams and partner organizations; and reviewing grant documentation to understand how teams had pivoted from, adapted, or built upon their previous work. Through this selection process, we established a more systematic understanding of each project and the challenges teams sought to address.

The results of our review are presented throughout the rest of this report, and focus on projects that improve practice and develop system capacity for quality math and science standards implementation, teaching, and learning. While we don't yet know the ultimate directions these projects — or the other projects which are part of the broader Partnership initiative — will take next in their work to support

standards implementation, we hope that the descriptions of teams' tools and practices can inspire others across the state to learn from and adapt useful ideas for their local contexts.

Helping Educators Understand What the Standards Should Look Like in Practice

The Common Core State Standards for Mathematics (CCSS-M) and Next Generation Science Standards (NGSS), as well as California's subject-matter frameworks,[1] provide some guidance for educators across the state regarding what students are supposed to know and be able to do in math and science. However, local implementers — especially teachers — make decisions on their own about how to craft instruction. With this autonomy comes ambiguity, and in some cases, uncertainty about how to design learning opportunities that support their students to meet the standards. Moreover, the standards and subject-matter frameworks are not intended to be specific enough to guide the kind of day-to-day decision-making that is required to implement the standards over time.

Since California adopted the standards (in 2010 for the CCSS-M and 2013 for the NGSS), educators have been asking for greater clarity about what these standards should look like in the classroom. They particularly want to know what they should expect to see students doing and saying during standards-aligned math and science classroom instruction. Clear understanding of these goals can help teachers decide which strategies they should use to support student achievement and can help coaches and principals better understand how to support and provide feedback to teachers.

Resources exist to help clarify and provide support on standards-aligned practices,[2] but they do not always answer all of educators' questions and they may not feel targeted to local contexts. **The regional and county initiatives underway within the Partnership are using tools and techniques that are**

[1] For more information on frameworks, please see A Framework for K-12 Science Education and the 2013 Mathematics Framework Chapters.

[2] For example, the National Council of Teachers of Mathematics' book *Principles to Actions* (2014) describes what teachers might be doing and what students might be doing for many of the central ideas of the CCSS-M (e.g., "facilitating meaningful mathematical discourse"). Similarly, the Teaching Channel provides a range of different supports, including videos of instruction and an online platform for teachers to engage with each other in discussions about math teaching.

designed to address the needs of California students and, as a result, are positioned to make standards-aligned instruction clearer for educators across the state. These tools include:

- Tools that define critical elements of instruction, as well as provide strategies to help educators share understanding, make sense of standards implementation, and guide student progress
- Tools used to organize professional learning experiences and help educators reflect on their instructional practices and student learning in ways that can help them iterate and improve upon on those practices
- Tools to help measure whether instruction is "hitting its mark" and making the desired impact

While most of the projects in the Partnership are using tools and strategies that have existed for some time, many of them feature elements that can stimulate important discussion, reflection, and broader application with other regional teams or among other educators outside of the Partnership.

Tools to create shared definitions of critical elements of instruction

The NGSS direct educators to keep three dimensions of instruction in mind: science and engineering practices; crosscutting concepts that unify the study of science and engineering; and core ideas in the major disciplines of natural science.[3] The CCSS-M standards include both the core concept standards and the Standards for Mathematical Practice.[4] Both sets of standards emphasize the importance of students being able to explain their thinking. For instance, in science, the sixth Science and Engineering Practice refers to students "constructing explanations (for science)" in math; the third Standard for Mathematical Practice emphasizes students' need to "Construct viable arguments and critique the reasoning of others."

These directives specify what is important for educators to attend to, but don't fully unpack the specifics of what teachers would see in classrooms if students were constructing scientific explanations or creating viable mathematical arguments. Because of this, educators have too often had to rely on their own interpretations of these goals and standards based on their own experiences, understandings, and biases, which can result in uneven and, thus, inherently inequitable standards implementation.

Driver diagrams. To improve implementation and enable educators within a region to speak a shared language around standards implementation in the classroom, several of the regional Partnership initiatives are using tools to clarify and establish common understandings about math and science

[3] More information, including the standards themselves, can be found at the Next Generation Science Standards website.

[4] More information, including the standards themselves, can be found at the Common Core State Standards Initiative – Mathematics Standards website.

instruction. For example, many have leveraged "driver diagrams,"[5] an integral component of improvement science methods, to come to a shared understanding of a desired outcome, the primary drivers or factors that contribute to achievement of that outcome, and possible solutions to address areas where those drivers turn out to be barriers. The idea of using a tool like this is that it can guide educators' mutual understanding and use of a common language, and help to establish a consistent standard for high-quality implementation regionally — one that is informed by information gleaned from specific county, district, or school contexts.

Tools to guide productive academic discourse. For Region 2, a vast rural area in northern California, educators have not often had the same opportunities to attend professional development as their peers from urban areas, which has undermined the development of uniform familiarity with the content and demands of the CCSS-M and NGSS. To help address this, regional leadership sought to create a professional development tool that could be made easily accessible across the region and serve educators across grade levels and across disciplines. Regional leaders decided that a focus on productive academic discourse[6] would serve math and science educators well because it is an instructional practice emphasized in both the science and mathematics standards, it can be a powerful tool to reveal student knowledge and understanding of learning concepts, and teachers can use it as a means of formative assessment when developing new lessons to target student misunderstandings (iMSS, 2018).

The Region 2 leadership team collaborated to develop a research-informed tool, as well as a method of training teachers to use it, that would not only help teachers across the region create a common understanding of productive academic discourse but would also support more meaningful use of discourse in their classroom instruction. The tool is designed to help teachers identify when and how to engage students in productive academic discourse. It is structured as a flowchart, so teachers can identify what instructional outcome they hope discourse will accomplish, which discourse tool(s) will help them meet that goal, and how to adapt those tools to their setting. The regional leadership team first introduced the tool to educators during a professional learning event, where small groups of educators discussed discourse and were encouraged to use the tool to reinforce the common understanding they were developing in person.

The tool and a focus on discourse remain an integral part of the region's second year work with their teachers, though regional leaders have made a point to implement small change ideas in this next phase of work, such as adapting the tool into a fully digital format to encourage widespread use. To see and use this tool, shared with the permission of the Region 2 leadership team, please visit their project website at https://sites.google.com/gcoegmail.org/interactivediscoursetool/home.

[5] A driver diagram, commonly associated with improvement science, is a tool to define an improvement goal, "drivers," or factors that have a direct impact on the desired goal, along with a set of actions or interventions that could be taken to achieve the goal. For more information on improvement science, please see *Learning to Improve: How America's Schools Can Get Better at Getting Better* (Bryk et al., 2015).

[6] Productive academic discourse, or meaningful conversations about academic subject matter, allows students to make sense of material together and helps teachers understand what students know and what they have not yet mastered.

Lesson Study: Professional learning focused on classroom teaching and learning

The collaborative teacher learning process known as "lesson study" has been used in California since 1999 and is a recommended practice in the 2013 California Mathematics Framework (California Department of Education, 2013). The intent of lesson study is to enable teachers to study an element of instruction and plan a lesson together, see the lesson unfold in a real classroom, and then reflect together on classroom instruction and implications for improvements and future instruction. It is the kind of active, collective, and iterative professional development that has been positively associated with impact on teachers' professional learning, skills, and practice (Blank et al., 2008; Desimone, 2009; Garet et al., 2001; Guskey & Yoon, 2009).

Although California educators have been using lesson study for some time, implementation quality varies, and lesson study has failed to scale broadly (Lewis, Perry, & Hurd, 2009). Some have called lesson study hard and time-consuming. Indeed, the formalized, careful reflection that lesson study requires may be unfamiliar to some educators. It is also typically more demanding than traditional "sit-and-get" professional development initiatives. Nevertheless, for the purpose of illuminating the specifics of instruction and alignment with standards, regional teams are finding value in organizing professional learning around classroom instruction and are taking a couple of different approaches in the use of lesson study in their regional initiatives.

Varying the lesson study approach to meet local contexts. Some regional teams using a lesson study strategy are allowing for variation in how it can be used in different contexts, depending on local conditions and needs. In Region 6, in central California, regional leaders are asking groups of teachers in different counties to use a common framework of Universal Design for Learning (UDL) to guide their lesson planning. That common framework enables teachers to reflect on related content as they collaborate to ensure their lessons are accessible for students with all skills and abilities. However, Region 6 leadership has given local teams flexibility on how they use lesson study to organize their work. For example, team leaders realize that some districts lack substitute coverage, so teachers in those areas are unable to view planned lessons together. In response, the leadership team is allowing various lesson study "lite" adaptations, such as where teachers each teach the lesson on their own in their classroom then come together afterward to reflect. While the power of the shared lesson study process may be diminished in these adaptations, they accommodate local realities and limitations so that teams can do their best with and learn from at least some parts of the lesson study process.

Lesson study for multiple stakeholder groups. Similarly, the Region 11 (Los Angeles) science team is using lesson study to strengthen their teaching pipeline by offering lesson study for mentor teachers, the preservice teachers they are mentoring, and site administrators. The idea is to use lesson study to support and provide professional learning for different levels of education stakeholders so that there are multiple people in a school building who have a clear understanding of NGSS and who understand strategies for developing high-quality science instruction.

Equity-focused lesson study. The Region 11 math team is taking a different approach than Region 6 and Region 11 science, using a version of "high-quality lesson study for equity and excellence in mathematics," which was developed by the California Action Network for Mathematics Excellence and Equity (CANMEE).[7] For Region 11, this means using lesson study with fidelity to the model but also adding a focus on equity, particularly fostering student agency as a means toward achieving equity. Region 11's approach focuses on increasing teacher pedagogical content knowledge in mathematics, using equitable teaching practices to eliminate deficit thinking, building positive relationships with students, and encouraging the region's teachers to support all students.

While equity is supposed to ground educators' discussions, it is a broad and vague concept. To support educators to unpack the idea of equity, the team is using Alan Schoenfeld and colleagues' Teaching for Robust Understanding (TRU) Framework (Schoenfeld, 2013, 2014, 2016), which was introduced in one of the Partnership's thrice-annual leadership convenings. While the Framework defines five critical features of classroom mathematics instruction, Region 11 leaders have homed in on one element of TRU — student agency, ownership, and identity — as the primary focus for their work together, seeking to define and specify what this means and looks like in classrooms, especially for underserved students. The teachers who participate in the region's lesson study work start by choosing focal students to think about as they undertake the work, frame these students' abilities positively, and then plan a lesson that will enable all focal students to meet the lesson goal.

While it can feel overwhelming to tackle equity concerns, pairing an equity approach with the lesson study process designed to improve teachers' instruction means that the Region 11 team has identified an approach to help pursue multiple goals simultaneously.

Measuring to understand whether instruction is "hitting the mark"

As regional and county projects have evolved (and with direct encouragement from the Partnership leadership team), teams have increasingly begun to focus on measuring the impact of their standards implementation efforts. Assessing the impact of improvement efforts is important because it can help educators set priorities, test their ideas, and understand the big picture; it makes clear which elements of improvement efforts should be adapted, adopted, or abandoned (Takahashi, 2014). Because the projects conducted by regions in the Partnership ultimately seek to shape outcomes for students through affecting the attitudes, actions, or abilities of various education stakeholders, many have focused on data-collection strategies for measuring proximal outcomes they hope to influence. For example, using certain instructional routines in the classroom more frequently might be hypothesized to positively impact students, but unless we know more about related proximal outcomes, including how

[7] CANMEE is a group of mathematicians and mathematics educators from across the state of California who work to support the implementation of high-quality lesson study with an emphasis on equity and high-quality mathematics through symposia, facilitator and commentator training, and annual convenings. CANMEE was established after, and with the support of, the Partnership through funding from Bechtel. It serves as a critical collaborator in the Partnership. For more information, please visit the CANMEE website.

and how often the routines are being implemented, the impact on students cannot be easily interpreted.

Few initiatives have begun to measure impact on the true end-users of their improvement efforts — the students. While this is in part because the improvement effort is first about improving the capacity and knowledge of adult educators, it is also because adequately measuring impact on students is notoriously time-consuming, expensive, and complicated. Despite this, some project teams are taking steps toward trying to understand how their projects might lead to changes in student outcomes.

Measuring the impact of math in science talks. In Region 4, in the Bay Area, the leadership team designed a tool to help elementary teachers understand how to deliver "math talks" that leverage and give access to the math needed in a science lesson. The tool adapts the popular math talk instructional routine into a "math in science talk (MiST)." The aim has ultimately been to build students' capacity for sense-making, connecting math and science concepts, and feeling ownership and agency, and to improve student outcomes by bolstering understanding around the inherently connected nature of math and science ideas. In reflecting on their first year, Region 4 leaders felt that MiSTs had improved teachers' equity and STEM capabilities, yet they were unclear about the extent to which the MiSTs impacted students since the primary focus of the first year centered on refining the planning of the MiST routine. In year two, the team is more focused on understanding how the MiSTs impact students' ability to connect math and science concepts and to draw on sense making. They also want to understand the impact of MiSTs on students' identity, ownership, and agency for learning, as defined in the TRU Framework (also used in Region 11).

The team is currently asking participating teachers to select focal students as they plan and conduct their MiSTs. Teachers are asked to administer short surveys, termed "practical measurement" surveys, to these focal students after they teach each MiST lesson to gather information on topics such as how students feel about participation and whether they feel agency in the classroom. Regional leaders hope to engage participating teachers in a minimum of three Plan-Do-Study-Act (PDSA) cycles informed by these students' data, using student data gathered in each PDSA cycle to plan next steps for instruction and student support.

Region 4's measurement efforts — having teachers reflect on focal-student survey data several times in PDSA cycles — are designed to help participating teachers understand whether their perceptions of their instructional practices match the way students experience the lesson. That is, the measurements help teachers identify gaps between their own and their students' perceptions of lesson implementation. These data points also enable teachers to identify areas of instructional success for further replication, or areas to be refined or redesigned to better support student learning and progress toward standards. The "practical measures" survey[8] that Region 4 leaders are using is based on a collaboration among researchers and practitioners from several different institutions and has itself been iterated and improved on multiple times over several years.

[8] A copy of the practical measures survey can be found here: https://docs.google.com/document/d/1laRZjT7PxAtPadB7HbkxQyH_rvuOtPyO_TUSsA9JC-w/edit?usp=sharing

KEY TAKEAWAYS: HELPING EDUCATORS UNDERSTAND WHAT THE STANDARDS SHOULD LOOK LIKE IN PRACTICE

Identifying, adapting, or developing the right tools and practices can help educators understand and implement effective standards-aligned instruction. The following are some key takeaways from regional projects' efforts:

- **Shared focus.** Several of the regional projects used tools — such as driver diagrams and a tool to help teachers foster productive academic discourse — to provide educators with a shared focus and common definitions to inform collaborative reflection.
- **Lesson study.** Regional teams found value in implementing variations of "lesson study" as a way to provide productive professional learning focused on classroom instruction. For instance, one team is using Universal Design for Learning as its common lesson study framework, while another team is focusing its lesson study approach around equity.
- **Measuring impact.** As teams' projects have evolved, they are increasingly starting to measure the impact of their standards-implementation efforts. While most data collection is focused on proximal outcomes related to educators, some projects are working toward analyzing student outcomes. Region 4, for instance, is asking teachers to gather data on focal students in order to inform and refine instructional approaches.

Building System Capacity for Change and Improvement

Tools can help educators understand what instructional goals should look like in the classroom. However, without clear priorities and some coherence across the long list of improvement initiatives faced by California educators in all subject areas, math and science implementation efforts are likely to be limited or at the mercy of changing local conditions (e.g., the turnover of local administrators). Key goals for the Partnership are building statewide capacity for standards implementation and reducing variability across the state's regions and counties to hedge barriers to standards implementation.

In line with these goals, several projects are focused on developing regionwide capacity for improvement, which includes mitigating variability in their regional work. By building capacity at the

local level, these projects hope to enable more uniform implementation of their change initiatives. We highlight three different approaches that regional teams have taken toward creating system capacity:

- Building coherent local leadership structures
- Empowering leaders to advocate for instructional change
- Aligning improvement efforts to create coherence and differentiate support

All three of these approaches are designed to empower local leaders — at the school, district, and county levels — to enact lasting improvements in math and science. Building strong local leadership structures can empower teachers and administrators to implement and institutionalize high-quality, standards-aligned teaching and learning. It can also help districts and counties maintain coherence across personnel changes and other local conditions. When counties advocate for improvement priorities, they unify local stakeholders with a common goal, which can guide more comprehensive standards implementations. And as regional work becomes aligned with state policy, teachers and administrators are more likely to hear consistent messaging across the system.

Building coherent local leadership structures

Educational change and improvement cannot succeed without leaders who can guide efforts and draw on and broadly communicate a clear vision of desired goals, and the steps needed to achieve them (Fullan, 2004, 2015). In complex systems like districts, counties, and regions, change efforts can be more productive and sustainable when leadership is distributed across system levels (Perry, Marple, & Reade, 2019; Spillane, 2005), because such distribution can build systemwide ownership, authority, and accountability for improvement. For example, through California's Local Control and Accountability Plan, district and site principals have significant responsibility for contributing to and communicating the vision of change efforts, facilitating the use of effective practices for teachers and students, and coordinating with leadership at the other levels (Perry & Reade, 2018). Likewise, educators and administrators at all levels — in the classroom, at the district, in county offices, and across counties — have unique roles to play in achieving goals for standards implementation. Systems may be better poised to execute a shared vision for high-quality and equitable math and science education if system leaders cultivate local leaders and leadership structures that cross all levels of the system. Regional needs and capacity sometimes necessitate the prioritization of staggered leadership development that focuses on one level at a time. Leadership structures that include local leaders can also increase representation and inclusion, as local leaders may represent a broader range of districts and counties than a group of high-level leaders. This is a potential strategy for addressing a challenge we observed across the Partnership — the difficulty of reaching every corner of a region — and many project leaders have struggled to reach and partner with as many of their teachers as they would like.

Some regional teams have prioritized the development of cross-system leadership structures to guide regional consistency. For example, during their first year, the Region 8 science initiative in southern California built out both horizontal and vertical leadership capacity for NGSS implementation, bringing in leaders across system levels and role groups, and sometimes from outside the system itself. This cross-

system leadership-development strategy stemmed from discussions among a small group of regional education leaders participating in the Partnership's science Community of Practice meeting, where they had the opportunity to discuss common strengths, needs, and resources in their counties. They decided to extend the group into a larger NGSS Leadership Committee that would both create a regional NGSS asset map to identify priorities and develop a regional NGSS action plan that recognized and responded to each individual county's diverse set of challenges and attributes.

Fifteen cross-organizational representatives — three from each of the region's four counties, as well as science subject-matter project directors — were selected to serve on the NGSS Leadership Committee based on their science needs, their capacity to provide support, and their extensive knowledge of their local educational contexts. Committee members include county office of education directors, science specialists, science coordinators, as well as science leaders found outside of the K–12 system, such as leaders from universities or from the California Science Project. This horizontal approach to building a distributed leadership structure invited inclusiveness and provided diverse perspectives on regional NGSS needs. Members met in face-to-face and virtual meetings as needed and established a common vision and common goals for standards implementation. They also asset-mapped to identify local gaps and pockets of strength, participated in professional learning experiences to disseminate NGSS instructional strategies, and reported to each other about the uptake of their learning at the local level.

In addition, the NGSS Leadership Committee recognized the need to cultivate site-level NGSS leadership, particularly with school principals and teachers, to inspire them to take ownership for improving standards-aligned science instruction and opportunities for students. The region organized an all-day administrator training event with principals in one county, to help them recognize effective NGSS strategies, learn about assessments to help observe and guide NGSS three-dimensional learning, and cultivate their engagement in regional efforts. Project leaders also invited teacher leaders to participate alongside them and other county representatives in a three-day summer training with the Exploratorium to deepen their understanding of NGSS strategies and be able to serve as instructional leaders at their own sites. These leaders continued to convene as part of new or existing county NGSS Leadership Networks to further disseminate Exploratorium resources and experiences. Now in their second year, the Region 8 team is building on the leadership structures they put in place and further supporting their teacher leaders' instructional improvement with lesson study.

Empowering leaders to advocate for instructional change

Shifts in math and science standards are ultimately intended to promote improvement in classroom instruction and learning. However, changes in the classroom are most likely to take hold if school leaders endorse and advocate for them. Teachers look to administrators for the encouragement, confidence, and "consent" to embrace standards implementation changes (Iveland et al., 2017, p. 1). For this reason, projects like those supported by the Partnership have often included a focus on building administrator knowledge of and buy-in for the math and science standards as an element of developing their leadership. In keeping with this trend, many project teams have sought to generate greater buy-in,

or understanding and support, from administrators around the instructional shifts that come with changes in math and science standards implementation.

While these efforts aim to build leaders' buy-in and capacity for math and science standards implementation, they may not necessarily empower leaders to prioritize or enact changes that could lead to higher-quality or more equitable math and science education. This possible gap between capacity and action has inspired a few project teams to move beyond just promoting buy-in to integrating a component of advocacy into their professional development offerings to build both the right knowledge and right mindset for effectuating change. Whereas "buy-in" can be characterized by consent, support, or understanding, "advocacy" pushes leaders to proactively initiate systemic changes that create the necessary conditions for more equitable standards implementation.

For example, the Region 4 science team, located in the Bay Area, spent their initial grant year convening elementary administrators for a symposium designed to improve their understanding of science education and the NGSS, address science teaching and learning for English language learners, identify and remove barriers to elementary science instruction at school sites, and explore science phenomena. After participating in the symposium, district- and site-level administrators reported in follow-up surveys that they have more positive attitudes about and greater comprehension of the NGSS. They also felt a desire for further engagement, but some shared that they did not feel more capable of creating the systemic changes identified in the symposium. The regional team noted in their application for the 2019–20 project funding that administrators' lack of empowerment to create change would challenge their overall regional goal of increasing the amount of time dedicated to elementary science instruction.

To address this in their second-year work, the Region 4 science team is incorporating another Partnership-supported initiative, an NGSS administrator support resource co-developed by a Region 4 science team member, to build administrators' advocacy for science. One module, "Support and Advocacy," helps site principals identify possible barriers to systems change and the steps they can take to eliminate those barriers when they arise. By incorporating an emphasis on advocacy into their three full-day events for all regional district teams and follow-up support provided by county office of education (COE) leaders, the Region 4 science team hopes that the knowledge they seek to impart about implementing high-quality science instruction in the earliest grades feels more actionable for site leadership.

Aligning improvement efforts to create coherence and differentiate support

A key goal for the Partnership is to create coherence and reduce variability for standards implementation across California. One way to do this is by leveraging and aligning efforts with state policy, and by responding to localized needs through differentiated support. In 2015, California passed SB 359, a math placement act requiring districts to adopt "fair, objective, and transparent math

placement policies."[9] Under the state's accountability system, COEs now also have primary responsibility for supporting districts in their region who have been identified for differentiated assistance in response to identified performance issues, including significant disparities in performance among student groups. In order to address such issues and promote equity, the Region 8 math team in southern California spent their first year of work integrating their regional and improvement advocacy efforts by prioritizing math placement and pathways.

Region 8 COE leaders were spurred to action on math placement after learning about multiple cases where students in their districts from underserved groups had been disproportionately placed into mathematics pathways that featured less rigorous course offerings, regardless of their demonstrated subject readiness (Salciccioli & Finkelstein, 2019). COE leaders leveraged the state's differentiated assistance process — and the funding that accompanies it — to partner with districts on solving this inequitable placement issue. The COE staff and district partners examined district-level data, identified troublesome trends (e.g., trends related to early tracking, course selection, and math outcomes), and created strategies for achieving more equitable access for all students. The team continues to partner with districts for placement work, which is differentiated based on the equity challenges each district is trying to answer. For example, some districts are exploring how assessment affects placement, whereas others want to know how 9th grade classes affect math learning throughout high school.

The regional team also sought to create a generalized, adaptable protocol to enable productive conversations with districts about how to analyze current math pathway policies and outcomes, and to provide more equitable math opportunities for students.

While the project team is concerned about math placement policies that foster equitable learning opportunities for students, this issue may not be top of mind for educators overwhelmed by differentiated assistance needs and the array of change ideas that districts face at any given time. Still, when a district is eligible for differentiated assistance, COEs may help districts improve equitable access to high-quality mathematics course offerings. The connection between the COE and district may provide an opportunity for both parties to understand and address broader system challenges that impact all students. In essence, the differentiated assistance may help COE providers understand a district's current priorities, practices, and policies well enough so that their support is coherent and aligned with a district's current state. And differentiated assistance may help districts develop the ability to push the right levers to address systemic factors that impact performance.

[9] This act was developed in response to the finding that districts throughout California did not have equitable or consistent policies to determine which students were placed in which math classes. Uneven math placement led to underrepresented minority students being placed in lower-level math classes more often than their white peers, which has a negative effect on performance in high school and beyond. The text of the Math Placement Act can be found here: California Mathematics Placement Act of 2015.

KEY TAKEAWAYS: BUILDING SYSTEM CAPACITY FOR CHANGE AND IMPROVEMENT

Building system capacity for standards implementation change and improvement takes significant time and work but, once developed, it can empower local leaders and contribute to county, regional, and statewide coherence for high-quality teaching and learning. Key takeaways include:

- **Coherent local leadership.** Distributing leadership across system levels — and, where possible, coalescing efforts and experiences — can create a cadre of expertise for standards implementation across the education system. For instance, Region 8 formed an NGSS Leadership Committee made up of 15 cross-organizational representatives.
- **Empowering leaders.** Bolstering administrators' content knowledge in math and science and empowering them to advocate for instructional change can help them envision and enact priorities around standards implementation and improvements.
- **Aligning improvement efforts.** In some cases, efforts to address state policy by providing differentiated support to address local needs can be used to help establish uniform standards implementation efforts across the state.

Conclusion

The noteworthy practices highlighted in this report represent several different approaches to improving standards implementation. They represent not just changes in practice, but structural and cultural changes about how improvement efforts need to be organized. While approaches may have differed, commonalities exist across the highlighted practices in that COE leaders identified problems, thought about solutions that would be most beneficial for local educators, and offered supports that honored teachers' and administrators' deep, existing knowledge while offering new strategies to improve practice. While COE leaders were often adapting practices that had been developed elsewhere, the changes they made were designed to have an ongoing, system-level impact by emphasizing local leadership, equity, and alignment across system levels.

We hope that the noteworthy practices described throughout this report provide ideas for local science and math standards implementation innovations that can improve instruction and learning.

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