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Developing Resources to Build Statewide Capacity and Cohesion for Mathematics and Science Standards Implementation

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Contents

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Introduction

In 2015, the California County Superintendents Educational Services Association (CCSESA) collaborated with the state's Department of Education and Board of Education to create the California Partnership for Math and Science Education (the Partnership). The Partnership takes a multi-pronged approach to improving the teaching and learning of the Common Core State Standards for Mathematics and the Next Generation Science Standards. A key goal of the Partnership is to reduce the variability in and build statewide capacity for mathematics and science standards implementation. As part of this goal, the Partnership dedicated $195,000 of project funding from the S.D. Bechtel Jr. Foundation to two resource development programs, for a total of $390,000:[1] The Fostering NGSS Implementation Program (FNIP) and the Fostering Math Standards Implementation Program (FMIP).

The programs drew on a diverse body of expertise and cross-regional and organizational leadership to encourage the creation of math and science resources over an eight-month period[2] that could both address common standards implementation challenges found across the state and promote equitable math and science opportunities for all students. As such, the development of the resources aligned with the Partnership's overarching goal to reduce variability in, and build capacity for, standards implementation. While ambitious in their timeline and scope, the FNIP and FMIP also provided

[1] While equal funding was allocated for both the math and science resource development programs, the total amount allocated for science (FNIP) was distributed among three planned resources so that each leadership team received $65,000. As part of a competitive proposal process, only one math resource was chosen to receive the full $195,000 allocation for math.

[2] The timeline established for the FNIP and FMIP proposal and development processes ran from April–December 2018, with 2019 reserved for resource implementation efforts.

opportunities to begin prioritizing the development of resources that can be used statewide and which carry the potential to address a variety of California educators' and students' needs.

For science, the FNIP resource grant supported the development of resources in three priority areas that had been identified and voted on by a group of experts from a science planning and collaboration committee in the Partnership. These priorities were integration of the NGSS with other content areas; principal and district administrator development; and three-dimensional assessment to help understand student learning across NGSS performance expectations (e.g., science and engineering practices, core ideas, cross-cutting concepts). The committee either elicited or nominated volunteers to lead and execute efforts — from proposal planning to design and development — in each of these three areas.

The mathematics resource grant program (i.e., FMIP) involved a competitive call for proposals to create professional development modules focused on fostering leadership, changing mindsets, and promoting access and equity in mathematics, with an emphasis on supporting improvement for students with special needs. Three proposals were submitted, and one team was selected for funding.

Despite the different processes involved in establishing and selecting the projects to be funded through the FNIP and FMIP, both efforts resulted in teams of leaders (e.g., content specialists, coordinators, non-profit representatives) working together across regions and organizations. These leaders felt that their collaboration, which crossed regional boundaries, was beneficial for resource development because of the different perspectives brought to the table. Some saw such collaboration as a potential statewide strategy for supporting high-quality math and science teaching and learning writ large. The resource development teams were made up of consultants, leaders from county offices of education, and subject-matter leaders, such as science centers. As noted above, efforts emphasized coalescing teams from across regions and institutions to promote sharing knowledge and expertise, and creating tools that could be used more broadly. From the outset, these teams honed their goals and expectations to help conceptualize resources that would address problems of practice, from offering district support on universal design for learning (UDL) to helping educators understand shifts in science instruction and learning prompted by the NGSS.

WestEd spoke with team leads from each of the four funded projects (i.e., three science projects and one math project) to learn about their key takeaways from developing resources. Team leads noted that collaboration to create statewide resources requires norming processes to level understanding and set direction. Additionally, they noted that effectively piloting resources and scaling implementation takes considerable time, continuous improvement, and intentionality.

This brief focuses on these four teams' experiences with planning, developing, and piloting their resources. It first examines aspirations and expectations for the resources, and perspectives on progress made toward aims. It then examines key processes and activities concerning leadership structures, planning and development, and piloting that teams engaged in to develop their products and attain their goals. The brief concludes with key challenges and lessons learned, then provides a list of recommendations for funding or implementing further resource development efforts requiring statewide collaboration and scale.

Planning and Developing the Resources: Key Processes and Activities

Science resources. As stated earlier, a science planning committee identified focus areas for the science FNIP resources, based on committee members' shared knowledge of common NGSS implementation challenges across California. These focus areas were determined before bringing together development teams. In at least one instance, a resource development team had been grouped together without any prior input into their resource until meeting to begin planning and conceptualizing the tool. Each of the three science resource teams were tasked with honing the content and material necessary to address not only the specifics of each resource, but also the larger goals of reducing variability in NGSS implementation and developing materials for statewide scale. Collectively, all the science resources focus on building understanding of the shifts required by the NGSS in science instruction, learning, and assessment. The following are the three FNIP resources that were developed:

- **Tools to Develop 3D Classroom Summative Assessments:** These tools include modules that are designed to provide teachers with assessment resources that support the development of high-quality three-dimensional assessment items for summative purposes. The NGSS's three dimensions focus on student learning and understanding of science and engineering practices, cross-cutting concepts, and disciplinary core ideas, which can be demonstrated through performance expectations. The tools allow teachers to analyze, modify, and create assessment items by unpacking the performance expectation(s), analyzing and modifying existing assessment items, and developing new assessment items.

- **Integrating NGSS with Other Content Areas:** This resource is an NGSS integration and implementation protocol, with templates for lesson sequences that are integrated with other standards and informed by teachers to reach multiple tiers of educators.

- **Principals Supporting the NGSS:** This resource includes five administrator modules grounded in "best practices" to support principals and district leaders to understand three-dimensional tools and to model student learning. The modules cover 3-D classroom experiences and observations, support and advocacy, convergence of standards, and site-level planning and implementation.

Math resource. The FMIP resource, called **Math Success for All**, focuses on offering cohesive district support. It provides eight robust professional development modules to guide high-quality math instruction and learning for students with special needs. The modules cover a range of topics, from

evaluating practices aligned to rigorous standards, to using Plan-Do-Study-Act cycles, to supporting inclusive math learning and administrative leadership. In addition, the modules weave together approaches related to UDL, growth mindset, improvement science, and system change, which are all viewed as essential to providing equitable and accessible teaching and learning. Aiming for versatility and integrity over fidelity, the modules are also flexible enough to be contextualized to or used across regional and district needs.

Even with tight timelines and the challenges incumbent in the large scale of the work, the four teams were still able to develop their resources and advance their goals during the eight-month development period. All teams created resources that begin to address the potential for reaching educators in different regions and which provide a compendium of professional development materials to be used across the state to strengthen standards-aligned math and science teaching and learning. This, in turn, helps support the Partnership's efforts to reduce statewide variability in and build capacity for high-quality standards implementation.

The resource development came with successes and challenges. The teams described key processes and activities that supported success, or hampered progress, along the way. In the sections below, we share details about these processes and activities, which primarily involved adopting distributed leadership and work structures to leverage talents and skills; calibrating cross-organizational knowledge and expertise for common understanding of and collaboration on concepts embedded in the standards; and establishing iterative and reflective feedback and implementation processes aimed at addressing broader resource uses and needs.

Leadership: Adopting Distributed and Diverse Structures

In order to develop statewide resources with the aim of reducing statewide variability in standards implementation and to build out the focus areas of each FNIP and FMIP tool, teams had to first adopt structures to lead their efforts. For the most part, development teams for the science resources adopted forms of distributed leadership and worked together to leverage capacity in the project's short timeframe. The forms these structures took varied, from teams that had a dedicated member to keep focus on the agenda to everyone "hitting the ground running." The math resource was primarily organized by one key leader, with team members offering supports and collaboration at various levels and availability.

Collaboration was intentionally built into the funding process for both resource development programs, though requirements for the math resource encouraged more geographically dispersed representation, including inviting partnership from outside the state. The overall intent of the grants was to spur collaboration outside of existing geographic, and even content-specific, boundaries in order to broaden the applicability of resources across the state and subject areas (e.g., incorporating a focus on UDL to reach diverse student needs found across California, integrating the NGSS with other standards). This approach resulted in resource development teams made up of diverse partners, some of whom had not worked together before. In general, teams for the science resources considered this diversity to be helpful and balanced, and team members were able to work and bond together. The 3D Assessment

development team, for example, included a teacher on special assignment, two county office representatives, and a higher-education expert. The variety of stakeholder involvement provided, as one lead noted, "a nice balance of different perspectives to the conversation."

The ability to work together was often grounded by complementary know-how, experiences, or desires aligned to resources' aims (e.g., knowledge of how to create tools for teachers, previous experiences with conducting professional development, knowledge for building a coherent story line). To establish a common ground for developing their resource, the FMIP team worked toward understanding each member's relevant knowledge base and expertise. They also worked toward "norming," or creating a shared idea for what their work would entail. Norming proved to be an essential process that allowed them to develop greater cohesion and helped them support resource development efforts in ways that also built and relied upon team learning.

Planning and Development: Establishing Processes to Calibrate and Collaborate

Alongside the structures that teams established, they also had to create processes to carry out their work and calibrate their understanding, expertise, and anticipated outcomes, especially considering their diverse regional representations and interests. The teams' most salient strategies and processes included the following:

- **Holding multiple team conversations and meetings.** Resource development teams held multiple in-person or virtual discussions to conceptualize their resources. These meetings established collaborators' various foundations of knowledge; invited mutual understanding around the work; and helped identify contributors' areas of expertise so that they could begin to set norms for their collaboration.

- **Canvassing the existing resource and data landscape.** Teams also researched and consulted online resources to aid in the development processes. To inform their thinking, they looked at existing tools and documents, such as a national document on NGSS assessments, and explored extant data like those found within the state's summative math student achievement test (the California Assessment of Student Performance and Progress, known as the CAASPP). Teams also explored data from surveys administered from prior Partnership-sponsored project work, such as event and workshop evaluation forms. This research not only helped to inform content needs for resources, but it also helped teams avoid developing tools from scratch or duplicating them.

- **Adopting a "divide-and-conquer" approach.** Tapping into the various skills that leadership possessed, some teams distributed leadership and responsibilities to conduct research, take on tasks, and share the workload. The FNIP resource teams noted that the approach allowed them to better leverage individual member's skills, be it working with administrators or developing protocols, and helped to establish responsibilities. Distributing responsibilities also helped teams progress through the stages of resource development when up against a tight timeframe.

- **Iterating and reflecting together around planning.** Leadership teams also highlighted the importance, and necessity, of iterating around resource design and reflecting early in the proposal development and planning processes, as resources were being conceptualized, in order to incorporate team members' thoughts and feedback. This allowed team members opportunities to participate fully in conceptualizing resources and for everyone's voice to be heard.

Piloting Resources: Seeking and Addressing Feedback

Emphasizing iterative and continuous improvement processes, organizers of the broader Partnership efforts spearheaded and launched formal pilots of the resources that teams developed. They piloted these resources through the Partnership's communities of practice (statewide math and science communities that met three times annually to collaborate on standards implementation issues), which enabled the resources to be introduced to and used by educators and administrators across multiple regions and counties. Resource development teams did not always help organize these pilot processes, and found they provided varying levels of useful feedback. Because the communities of practice represented such a large and diverse group of stakeholders, most teams indicated that it would have been helpful to provide more precise context and guidance, including more clearly emphasizing how resources get tested and by whom, facilitator and recipients' roles, and clear procedural expectations.

Prior to piloting through the communities of practice, teams intentionally planned for and created "pre-pilots" to seek out feedback on their tools so they could refine them accordingly. Because of timeline constraints, some teams expressed that they were creating and refining materials as they delivered them to various stakeholders. Pre-pilot stakeholders included volunteers with time who responded to requests for review and feedback; representative audiences who would benefit from the resource, such as administrators across urban-rural lines and education segments; and recipients of incentives. The feedback received from these pre-pilot implementation attempts came from surveys; questions to engage stakeholders in dialogue; improvement meetings; and "read behinds," a strategy in which stakeholders review initial materials and provide feedback.

Some teams viewed this feedback as more immediately critical and beneficial to the early stages of their development process — particularly for informing refinements to tools or providing opportunities to reflect on and measure users' reception of the tools — while others saw it as a source of information to compile and use for revisions as time permitted. Early pilot processes that teams established helped them calibrate and better understand both facilitators' and users' needs for the resources, including what might make the tools more applicable for scaling across multiple audiences. For example, two teams realized a need for training, either for facilitators or for resource recipients, on how to use their resources. Teams also realized that they needed guidance on how to elicit consistent and useful feedback. Piloting the math resource uncovered that people who received the resource did not have enough time to field test all modules, given the time limitations and the amount of rich information provided.

Ultimately, teams stressed the importance of piloting their resources in order to learn from users. Some teams conducted additional pilots to promote continuous improvement of their resources and invited further feedback to hone refinements. They also offered key recommendations for effectively conducting pilots in ways that can better support, inform, and scale implementation efforts, including the following:

- **Establish a clear process or structure to capture feedback.** Resource development teams stressed creating structures for piloting or field testing to capture formative feedback, identify user groups, and track how resources get used. Suggestions included piloting through targeted groups working in networks or leveraging internal systems that could reach target audiences across organizations. The math resource team, for example, has established a networked improvement community as a way of both rolling out the resource with support and additionally piloting its effectiveness.

- **Set expectations and lead time.** Resource teams also underscored setting expectations for target audiences so that they can provide the type of feedback or implement resources in ways that would be most helpful for continuous improvement efforts. Adequate lead time is also needed to find target audiences and money to provide incentives for their participation.

- **Take the time to provide resource training and to avoid "short-changing" processes.** Resource development teams planned for multiple pilot rounds and feedback loops, and they underlined that these processes took time. For example, people need adequate training — more than just an overview — in order to understand how to use newly developed resources. Time is also necessary to manage and address feedback loops, otherwise processes could be rushed and thus short-changed.

- **Articulate how resources should most appropriately be used to support standards implementation.** Using the resources, in full or in part, on their own will likely not be sufficient as a way to teach users how to fully implement math and science standards, because professional learning is not just a "one-off" experience. Benefits may come from using developed resources over time, as part of a larger learning process, and through having multiple opportunities to review and reflect on learning that is informed by them.

Key Challenges and Lessons Learned

While they appreciated the resource-development funding, teams noted that the relatively short eight-month **development timeline, and time in general, were key challenges** that they faced. Some

perceived that the timeline restricted, or "short-changed," processes involved with continuous improvement such as being able to fully address feedback or take adequate pause to seek support. In addition, teams noted that support and collaboration for the work were impacted by busy schedules and other work responsibilities, factors which were compounded by tight turnaround time.

Teams also faced **challenges with building cohesiveness for their resources**. For the FMIP resource, these challenges included having difficulty establishing understanding and visioning around the work, and finding the right content to create through-lines among resource sections. An FNIP team leader noted that there were challenges in designing tools in ways that consider learning for both the facilitator developing training on a resource and for the resources' target audiences.

In response to these challenges, teams also highlighted lessons they learned from them. These included the **importance of norming** as a process that helps establish common understanding and visioning for the work. At the same time, some teams noted that it is helpful to have **someone accountable to lead the work** and to be cognizant of the timeline and move each stage of work forward. One FNIP team emphasized the importance of recognizing and accepting the **difficulties involved in scaffolding and guiding learning** processes in ways that take into account and reach all anticipated audiences. The team also emphasized the **benefits that collaborative strategies and group reflection** have on enhancing resources and their development.

Next Steps and Recommendations

The Fostering Implementation Program resources are currently in different phases of next-step planning, with some teams deferring to Leaders of the Partnership for further dissemination through the Partnership's website (capmse.org) and other teams incorporating additional minor revisions or implementation and piloting efforts. Despite the challenges encountered — primarily with time constraints — teams pointed to the benefits of coalescing diverse expertise to collaborate on developing resources to support math and science standards implementation. These included the benefits of establishing common understanding to ground diverse interests and to advance resource development and bonding around shared knowledge and mutually beneficial experiences in ways that furthered efforts to tackle local and regional math and science implementation challenges at a larger scale.

Based on teams' experiences and recommendations, the following considerations can help inform further large-scale resource development or funding efforts in the future:

- **Seize opportunities to collaborate.** When faced with a good idea, an opportunity to collaborate outside of regional or local boundaries, or a group of ready and willing talent, do not waste time hedging or contesting. As one team noted, it is important to keep in mind that passion and the work itself drive efforts as much as the people involved or structures put in place. Passion and the work itself, then, can transcend localities.

- **Be deliberate about who is at the table and about establishing mutual understanding.** Infuse continuous communication and improvement efforts throughout collaboration and work toward mutually understanding goals to solidify teamwork. Team members from diverse organizations might have different ideas and understanding of efforts but working toward leveling these can strengthen and ground talents.

- **Articulate plans and processes, including building awareness for resources and implementation.** Articulating plans for developing resources, establishing feedback loops, and planning for dissemination will help guide development and collaboration. Along the same lines, taking the time to build awareness for processes, resources, and training helps foster effective learning and use of materials for piloting, field-testing, implementation, and scaling.

- **Recognize that there will be conflict involved in the development process.** As the FMIP lead noted, conflict is part of the development process and can occur at multiple phases, from norming team members' understanding of the work to choosing and blending content into a "usable tool with professional development embedded into it." Norming can be particularly important in helping to manage conflict or a diverse array of perspectives involved when collaborating across multiple organizations and localities.

- **Keep in mind the different ways that resources may be used.** Learning is complex and a resource may be used differently with various audiences. Try to recognize and plan for the different ways that a resource may be received and implemented. Providing professional development for resources can support resource implementation and use in ways that both meet and contextualize goals.