The Instructional Leadership Corps

Teachers Leading Sustainable Professional Learning in Their Communities

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Executive Summary

The teaching profession requires continuous learning, and in 2014, a new model of professional learning was introduced in California by the Instructional Leadership Corps (ILC), a group of expert teachers who organize local professional development to spark iterative changes in practice. In the four years following its launch, the ILC connected with more than 100,000 educators[1] through an approach that supports school-based learning and develops teacher leaders as well as instructional leadership among administrators. It has begun to transform California's statewide capacity to implement the Common Core State Standards (CCSS) and Next Generation Science Standards (NGSS). These new standards are moving instruction away from a transmission curriculum that often featured scripted lessons and multiple choice tests toward higher-order critical thinking skills acquired through student engagement in inquiry and problem-solving—a shift that requires major transformations in how teachers teach and students learn.

The ILC is a statewide collaborative teacher professional learning project launched by the Stanford Center for Opportunity Policy in Education (SCOPE) in partnership with the California Teachers Association (CTA) and the National Board Resource Center (NBRC) at Stanford. SCOPE fosters research, policy, and practice with an emphasis on equitable resourcing of high-quality educational systems and building educators' professional capacity. CTA supports teachers in multiple ways, including professional learning opportunities. NBRC supports professional development and promotes teacher leadership as candidates progress toward and obtain National Board certification.

The ILC's reach has been extraordinary. Since its inception in 2014, ILC teacher leaders have provided multisession professional learning to more than 32,000 educators statewide, in more than 2,000 schools and at least 495 districts in California. An additional 30,000 educators participated in ILC-related conferences and presentations, and 38,000 more were indirectly impacted as ILC members trained instructional coaches in a trainer-of-trainers model.[2] The responses of these educators to ILC conferences and training have been overwhelmingly positive, with many participants identifying this as the best professional learning experience they have had.

The ILC has changed the paradigm for teacher learning in California. In lieu of outside consultants or vendors who often conduct one-shot, "drive-by" workshops before they leave for the next district, the ILC entrusts professional learning to local professionals who have the training and support to lead ongoing learning within their own districts—and, in many cases, to carry that learning to other schools and districts in their regions. Implementing the changes required by the new standards and the accompanying assessments across California—a large state serving a diverse and high-need population, and one that has experienced significant teacher shortages—poses considerable challenges. In 2013, a new funding formula and accountability system shifted decision-making to the local level and has allowed districts and schools to undertake the more organic capacity-building strategies offered by the ILC.

ILC Program Design

The ILC's purposeful approach, "teachers teaching teachers," empowers teachers to lead sustainable professional development and advance instructional capacity within their districts. ILC instructional leaders are primarily teachers, augmented by a smaller number of administrators, who have received intensive professional development from ILC experts on how to implement the key instructional shifts that the new standards require.

These instructional leaders bring that knowledge back to their home districts in the form of multiple **professional development workshops (PDWs)** interspersed with teacher-designed changes in classroom practice followed by opportunities to reconvene, reflect on, and refine these efforts, a hallmark of the ILC project. During these workshops, the leaders demonstrate what an instructional shift called for by the standards looks like in the classroom, support their colleagues in engaging in new practices and carrying them to their students, and then support them in developing appropriate lesson plans. In subsequent sessions, teachers analyze real-world results from the new practices, examine student work samples, and refine their approaches. In this iterative and collaborative process, teachers receive the ongoing support and development they need to make sustained and standards-aligned changes in classroom instruction.

In this study, we sought to discover how ILC teams in different settings gained traction and began to transform professional learning opportunities in their communities and regions, often addressing long-standing problems of practice and inequities in children's access to high-quality instruction. Given that practitioner-led professional learning has often failed to gain a toehold in districts in which teacher leaders are appointed but not integrated into the work of the schools, we wanted to understand what has enabled the work of the ILC to grow and become rooted in various communities. We examined the strategies used by ILC leaders both in conducting professional development and in connecting their work to the broader efforts of their districts and counties. We also examined the perceived impacts on practice for teacher participants.

We studied the work of ILC teams at four very different sites.

Madera Unified School District in rural San Joaquin Valley serves largely Latino/a students, with varying levels of English proficiency, from low-income families. In this district, ILC teacher leaders focused on language and literacy development across different curricular areas. They led workshops, developed a train-the-trainers program, and reached nearly every teacher and administrator in the district. To further sustain the work, they embedded the workshops as part of induction programs for new teachers in the district.

The **East Side Alliance** is a formal partnership between East Side Union High School District and its seven k–8 feeder districts in East San Jose, which range from moderate to extremely low income. Two ILC teams worked with and learned from each other as they supported new approaches to standards-based mathematics instruction. One team participated in large-scale mathematics symposia and professional learning collaboratives that brought together high school mathematics teachers and their middle school colleagues to align mathematics teaching across grades. The team members also led professional learning workshops in their home districts and beyond.

A second ILC team led workshops targeting the Standards for Mathematical Practice that complement the CCSS. These workshops included lesson study, in which teachers plan, observe, and provide feedback to support their colleagues' teaching practice. The work of these two ILC teams became a regular part of their districts' professional learning activities.

In **Conejo Valley Unified School District**, a high-achieving and well-resourced district in Ventura County, two ILC teams, composed mainly of middle school and high school teachers, led professional learning workshops and undertook coaching for colleagues to learn more deeply about how to implement the NGSS. Taking distinct but complementary approaches, one team conducted webinars, summer institutes, and workshops while the other team co-planned and co-taught science lessons with elementary school teachers. Both teams aligned their efforts with those of other science leadership teams in the district and in the county. Their work has become integrated in the district teachers' professional learning offerings.

At a fourth site, we investigated a partnership between a professional network of ILC teacher leaders in **North Orange County** and the Center for Careers in Teaching at California State University, Fullerton's College of Education. Through the center, the teacher leaders organized a series of "Teachers Teaching Teachers" conferences, offering sessions to teachers from a wide range of districts. Most of these sessions focused on the instructional shifts promoted by the new standards. In cooperation with the center's staff and with the goal of strengthening and diversifying the teaching profession, ILC teacher leaders developed new mentoring programs for beginning teachers and for high school students interested in teaching.

ILC Teams' Impact on Teaching and Learning

We found, like earlier evaluators, that the ILC project was associated with changes in instructional practice and greater student engagement in learning. Most participants in ILC workshops consistently report that their ILC experiences have influenced their curriculum, instructional strategies, assessments, student engagement, and student learning to a "great extent." During classroom observations, we saw teachers incorporate strategies and tools learned in the ILC workshops. Teacher leaders and administrators observed changes in teachers' perspectives and practices after they participated in the ILC: Teachers expressed feeling empowered to give more control to students and engage with the more challenging parts of the curriculum.

Teachers commonly attributed to ILC the increased levels of student engagement they witnessed: Students were more actively involved in lessons, explored multiple ways to solve a problem, exhibited perseverance in tackling difficult problems, and were more confident and empowered when faced with challenging subjects.

The ILC gave teachers a renewed sense of collegiality, purpose, and common mission that reaffirmed their professional identity, kept them engaged in their work, and gave them a sense of responsibility that extended well beyond their individual classrooms. Teacher leaders at all four sites found ways to collaborate with school and district leaders, as well as their teacher associations, to reach more teachers and to connect with organizations outside their districts, such as counties and universities, to realize systemic changes in the landscape for professional learning in their regions.

The ILC's success in helping teachers acquire sophisticated new practices while developing instructional leadership, increasing professionalism and self-efficacy, and building successful systems of professional learning reflects a promising model.

Lessons Learned

Five central lessons emerged from our findings.

1. Teachers value professional learning led by their colleagues.

When ILC workshops are contrasted with traditional professional development offered by outside consultants, teachers prefer learning from and with their colleagues. They recognize and trust their colleagues' knowledge and experience. Teacher leaders develop professional learning that is attentive to local needs and attuned to the specific challenges district teachers face in implementing the new state standards and assessments. ILC teacher leaders who work in the same district are also more accessible for follow-up questions, advice, and support. They are responsive and knowledgeable about the shared context and the educational needs of their students. They can demonstrate, not only describe, recommended instructional shifts.

The ILC demonstrated success in elevating teachers' understanding of the new standards and assessments, presenting instructional strategies that support students' learning, and developing teacher leadership. ILC teacher leaders and their colleagues, as well as site administrators, described increased student engagement as a main effect of the CCSS- and NGSS-aligned curricula and the changing patterns of interactions in the classroom.

2. ILC membership enhances teacher leaders' professionalism and sense of efficacy.

Creating and leading professional learning for colleagues is highly beneficial for the ILC teacher leaders. Realizing that they are helping to shape other teachers' practice increases their sense of professional efficacy. They are able to broaden their professional reach beyond their classrooms and thus amplify their leadership skills as they initiate innovative activities and solidify professional relationships. Empowering the profession was a frequent theme in the teacher interviews.

3. Supportive structural arrangements foster instructional change.

The curricular and pedagogical shifts that adoption of the CCSS and the NGSS required were ambitious, profound, and demanding. Moving from scripted curriculum and pacing guides to planning lessons with engaging learning activities was neither quick nor effortless. Successful and sustained change in instructional practice requires awareness and involvement from school and district administrators. Their role in allocating resources and acting as instructional leaders means that, as one teacher noted, "If it isn't a priority for principals, it won't happen."

Under the new paradigm of the CCSS and NGSS, site-level administrators need to play different roles from what was customary in the past. Including greater administrator involvement in instructional change is an aim of the ILC going forward. The ILC has increased the number of administrators as members, aided by the fact that many ILC teacher leaders move into roles with the district, owing in part to the success they achieve with the ILC. To align with more student-centered learning and sustain changes in instruction, administrators need to shift how they conduct classroom observations and provide formative feedback as well as performance evaluations to teachers.

A key structural change in districts in which the ILC is active is granting time and opportunity for professional collaboration. Time is one of the most critical resources for shaping teaching practice. ILC teachers and their colleagues need time and material resources for sustained

collaboration. When ILC teams can initiate systemwide structural changes, they create conditions for the project to take root in their locales. As PDWs became integrated with the districts' professional development calendars, they became institutionalized and part of routine district activities. As such, the ILC activities become legitimate district offerings and can gain access to and benefit from regular district resources.

4. **Systematic follow-up contributes to implementation of instructional shifts.**

Achieving depth versus reach is a perennial dilemma in teacher professional learning initiatives. We observed that lasting changes in pedagogy are more likely when teachers have the opportunity to try out new strategies, receive feedback, address challenges in implementation, and iteratively improve over the course of multiple workshops, with advisors and coaches at hand.

Frequency and quality of the follow-up opportunities are variable yet indispensable. Follow-up usually consists of teacher self-reports, verbal or written reflections with colleagues, and sometimes samples of student work. Follow-up that involves either the modeling of teaching practices in the classroom by ILC teacher leaders or observation and feedback of participant teachers trying out the instructional strategies is rare but important. Designing for long-range engagement and follow-up is a key element of lasting change and should be part of initial plans, so that the many benefits of teacher-led professional development can be secured.

5. **Strategic relationships support deep, widespread professional learning.**

ILC teacher leaders get greatest traction when they are able to build relationships with district administrators, teachers associations, county offices of education, universities, and philanthropic organizations. Partnerships with county and district offices, universities, and funding sources support content alignment and leverage financial and logistical resources at the local level.

As mutually trusting relationships developed, districts and teachers associations were increasingly willing to contribute resources. Contributions took different forms: direct financial resources such as stipends for presenters and participants, meals for participants (valuable for after-school workshops), and release time for ILC leaders. The significant investment of financial resources, effort, and time produced professional and personal rewards for the ILC teacher leaders and the teachers who participated in the larger- and smaller-scale activities.

We found that ILC teams are more successful when teacher leaders are able to connect to organizations and institutions that recognize the inherent value of their work and are willing and able to provide support and resources. Maintaining these connections and establishing productive relationships are necessary for project continuation and institutionalization.

Teacher leaders selected for the project brought with them extensive classroom experience, a commitment to improve students' learning, and a dedication and desire to strengthen the profession. Their professional expertise, their credibility, and their perceived legitimacy to offer high-quality professional learning were central to the successful outcomes of their activities. This was particularly important in the early phases of the project, as teacher leaders approached districts and other partners to offer themselves as providers of professional learning, something previously uncommon in many districts.

The Foundational Support of ILC's Institutional Partners

The ILC partnership of SCOPE, NBRC, and the CTA has been and continues to be indispensable. These partners provide ongoing guidance and support, access to intellectual and academic resources, sustained professional interactions, upkeep of the professional network, and personal recognition. Teachers with whom we spoke recognized the value of the productive collaboration among the three organizations.

The current and future teacher leaders need to continue to learn as they teach their colleagues. They need to continue to develop and refine their knowledge in additional domains and aspects of teaching as ever-new issues surface. Providing learning opportunities and organizing structured professional encounters among them and for them are essential for the growth and the strength of the network. The existence of a solid organization that continues to guide and support, document, and assess its outcomes is vital for the continued success of the ILC project.

Chapter I: Introduction

Teaching is a profession that requires continuous learning. With changing demographics and elevated expectations for educational outcomes, obligatory shifts in traditional pedagogy make constant professional learning necessary. In 2014, a new model of professional learning was introduced in California by the Instructional Leadership Corps (ILC), a group of expert teachers who organize local professional development to spark iterative changes in practice. During the next 4 years, the ILC connected with more than 100,000 educators[3] through an approach that supports school-based learning, develops additional teacher leaders as well as instructional leadership among administrators, and has begun to transform statewide capacity in California to implement the Common Core State Standards (CCSS).

Starting in 2010, the adoption and implementation of the CCSS and, somewhat later, the Next Generation Science Standards (NGSS) began a sea change in education in California. The new standards reflect the deeper learning competencies expected of high school graduates in the 21st century, including critical thinking and problem-solving, mastery of content, collaboration and communication, and self-directed learning. The state also adopted the Smarter Balanced Assessment System, now called the California Assessment of Student Performance and Progress (CAASPP), which employs a wide variety of items, including performance tasks, to assess students' abilities to apply critical thinking and complex problem-solving skills to real-world tasks and dilemmas.

The aim was to equip students with the knowledge and skills needed in a modern workplace and in a society characterized by rapid change, fueled in part by technological advancements. Because students need to read, write, and use language in all content areas, the new standards gave special attention to developing solid literacy skills, disciplinary discourse, productive ways of constructing viable arguments, and strategies to evaluate and expand upon the reasoning of others. In turn, incorporating robust pedagogical tools to support this kind of student learning and expected outcomes requires deeper professional learning opportunities for teachers than has traditionally been available and reliable, along with solid institutional support.

As California approached the implementation of its new standards, the state was still recovering from decades of tax cuts and budget cuts since passage of the 1979 tax cap, which were exacerbated by the effects of the 2008 recession. The fiscal crisis had a profound impact on the educational system and its districts, schools, students, teachers, and administrators. Severe budget cuts led to layoffs of personnel and reduced resources, resulting in increased class sizes and diminished services.

Wealthier schools protected and maintained a level of educational quality by offsetting budget cuts with local revenue sources and private donations.[4] Adverse outcomes were most remarkable in schools serving students from low-income families and schools with high proportions of Latino/a, African American, and immigrant students. A 2010 study by the University of California, Los Angeles found that, even before the recession, "such schools were eight times as likely as other schools in the state to face severe shortages of qualified teachers."[5]

In schools with less access to resources, teachers were at the front lines of maintaining quality education under difficult conditions. Severe cutbacks in educational programs, resources, and professional development days for teachers were juxtaposed with an unceasing demand for test

score improvements. Many districts adopted teacher-proof, scripted curricula and pacing guides. These required complete fidelity and, according to research on teacher perceptions, curtailed teachers' decision-making and eroded their sense of self-efficacy, professional identity, and pride.[6] This challenging environment also reportedly strained relationships between district administrations and the union and lowered morale across the teaching profession.[7]

Although California's economy improved and education funding stabilized with the 2012 passage of Proposition 30,[8] the effects of the recession lingered. The shift to the Local Control Funding Formula in 2013–14 gave districts greater flexibility to allocate resources based on local needs and coincided with the adoption of the new standards and assessments. As revenues increased, the state also allocated significant funds to districts for professional development and technology investments in each of the initial years of CCSS implementation.

Under Governor Jerry Brown, who adopted a philosophy of "subsidiarity," most decisions about how to run school districts were no longer made through regulations and categorical programs from the state level, but rather were placed in the hands of local communities through their Local Control Accountability Plans (LCAPs). Thus, as teachers needed to gear up for major changes in how to support and assess their students' learning, decisions about how to support them needed to be made at the local level.

This educational shift occurred in concert with pending changes in the teacher workforce. As the California economy rebounded from the recession, school districts began hiring again. However, since 2015, California has experienced significant teacher shortages, due in large part to high teacher attrition rates and exacerbated by teacher retirements and low levels of enrollment in teacher education programs.[9] Researchers predict that the state will need tens of thousands of teachers within the coming decade. Teacher recruitment and retention are most critical in urban and rural areas.[10]

Providing equitable education is among the most urgent concerns brought about by these two confluent developments: the need for student- and learning-centered pedagogy and the need to replenish the teaching profession. Schools and districts in more affluent or resource-rich areas may be more able to adapt than are their resource-poor counterparts. In less affluent schools and districts or in those experiencing high teacher turnover or greater numbers of high-need students, the demand for new professional learning opportunities represents an additional set of stresses. Yet it is imperative that Californians support all teachers to broaden and deepen their teaching repertoires and ready them to prepare their students well.

In a study of CCSS implementation in California, researchers found that, overall, administrators and teachers were enthusiastic about the new standards and the pedagogical shifts they implied.[11] Many local partnerships were created to support implementation, and there were also serious challenges. These challenges were of three kinds: lack of time to familiarize teachers with the new standards, insufficient availability of appropriate curricula and instructional resources, and worries about teachers' professional capacity to implement major pedagogical shifts and the system needed to support them.

In response, the faculty and staff of the Stanford Center for Opportunity Policy in Education (SCOPE)[12] partnered with the California Teachers Association (CTA)[13] and the National Board Resource Center (NBRC)[14] at Stanford to draw upon their institutional expertise in high-quality professional development and their networks of accomplished teacher leaders to initiate the Instructional Leadership Corps (ILC) project.

The Instructional Leadership Corps: Teacher-Led Professional Development

The ILC is a statewide collaborative teacher professional learning project launched in 2014 by SCOPE, the CTA, and NBRC. SCOPE fosters research, policy, and practice with an emphasis on equitable resourcing of high-quality educational systems and building educators' professional capacity. CTA supports teachers in multiple ways, including professional learning opportunities. NBRC supports professional development and promotes teacher leadership as candidates progress toward and obtain National Board certification.

These partnering organizations not only leveraged their collective resources and expertise but also brought together philanthropic organizations active in the field of education—the S. D. Bechtel, Jr. Foundation, the Stuart Foundation, the National Education Association, the California Education Policy Fund, and the Silicon Valley Community Foundation—who committed to fund the ILC for an initial 3-year period and to provide their collective experience to shape the program.

The ILC has changed the paradigm for teacher learning in California. In lieu of outside consultants who often conduct one-shot, "drive-by" workshops before they leave for the next district, the ILC entrusts professional learning to local teaching professionals who have the training and support to lead ongoing learning within their own districts—and, in many cases, to carry that learning to other schools and districts in their regions. Rather than the top-down standardized professional development opportunities that California offered in the 1990s and early 2000s, or the outside vendors who popped in and then left districts when state-sponsored professional development was discontinued, local control allowed districts to undertake the more organic capacity-building strategies offered by the ILC.

The new standards and the accompanying assessments require teaching and learning to focus on problem-solving, investigation, collaboration, use of evidence, effective communication, and self-directed learning. In California, the significant proportion of students still developing oral and written proficiency in English poses an additional demand for professional learning. Similarly, the shift from an often scripted curriculum to one focused on higher-order thinking skills developed through student engagement and inquiry—and from multiple-choice tests to problem-solving and performance assessments—made clear that curricula, classroom structures, and interactions between the teachers and their students needed to change.

The ILC approach was ambitious and new to California, but not unique. A similar initiative for teacher-led professional learning in Ontario, Canada—the Teacher Learning and Leadership Program—had shown benefits for teachers' professional knowledge and skills, self-efficacy, leadership qualities, and ongoing collaboration.[15] Researchers know that effective professional learning, which enables changes in practice to support student learning, is content focused, sustained and ongoing, grounded in the work teachers do in the classroom with students, and connected to broader school reform. It is collaborative so that teachers can learn with and from each other.[16] Successful professional development activities model effective practice, incorporate

active learning, and provide opportunities for feedback and reflection. International research also finds that opportunities for teacher professional collaboration are associated with increased teacher self-efficacy and job satisfaction and, in turn, with the active teaching practices that support the above competencies. Moreover, both mentor teachers and mentees experience the positive effects of professional collaboration.[17]

Collaborative forms of professional learning are important not only for improving individual teachers' practices but also for inducing systemic change. Education researchers Hargreaves and Fullan introduced the concept of "professional capital" as a strategy shown to change education and strengthen the effectiveness of the teaching profession.[18] It is the confluence of three other kinds of capital—human, social, and decisional—that amplify one another. Professional capital combines teachers' professional knowledge and skills, their collective capacity to form networks and communities of learning and practice, and their use of experience to make decisions about teaching and learning that are in the best interests of their students. Investing in the professional capital of the individuals, the group, and the system improves learning and achievement.[19]

"Teachers teaching teachers," the ILC's purposeful approach to empowering teachers, allows teachers to develop their professional capital and to lead sustainable professional development and advance instructional capacity within their districts.

"Teachers teaching teachers," the ILC's purposeful approach to empowering teachers, allows teachers to develop their professional capital and to lead sustainable professional development and advance instructional capacity within their districts. ILC instructional leaders who work in districts and schools all over California are primarily teachers, with a smaller cadre of site-based administrators. They have worked continuously for the past 4 years to deepen their practice as professional learning facilitators and to expand their reach across the state. In the process, they have developed leadership at the local level and connected districts, counties, and universities to one another and to teachers seeking to learn.

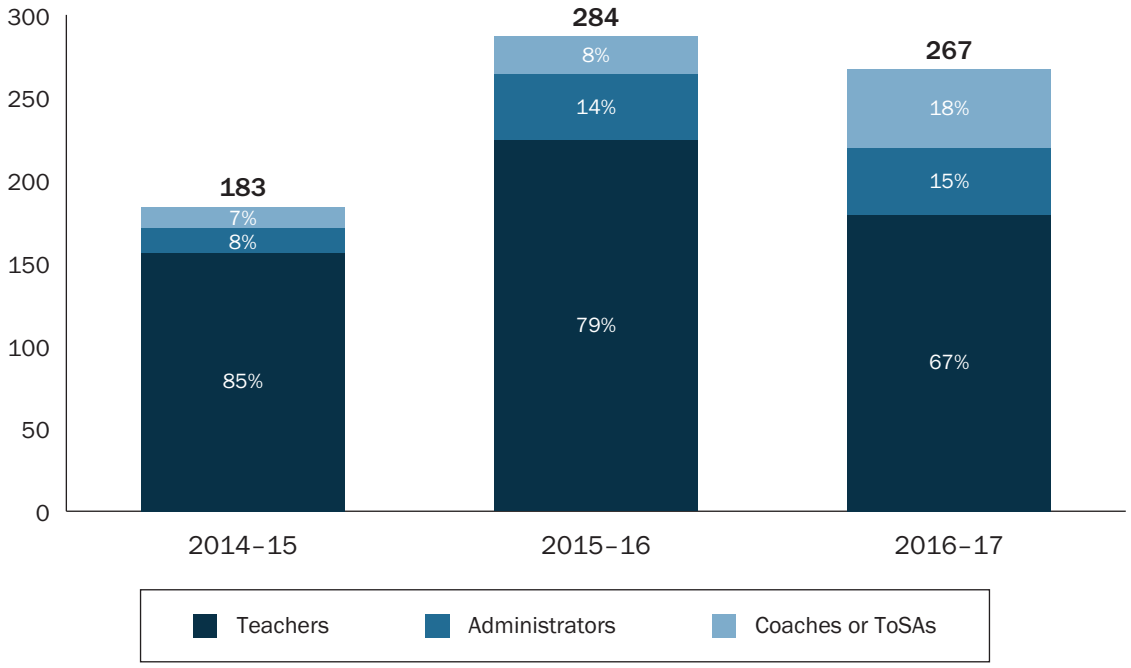
The design of the ILC

The ILC represented an opportunity to draw on teacher knowledge to develop their collective capacity and connect this to continuous improvement efforts in schools and districts. It was especially valuable in light of California's extensive budget cuts of the 1990s and early 2000s that nearly obliterated the professional development infrastructure the state once had in place.

In the summer of 2014, representatives from SCOPE, the CTA, and NBRC brought together a range of educational experts and stakeholders to design the ILC program. The ILC was launched at a 3-day event in October 2014. An initial cadre of 183 teacher leaders and site leaders was selected from an applicant pool of 500.[20] Selection criteria focused on evidence of instructional expertise and leadership as well as balanced geographic distribution and subject area expertise. Many applicants had formal or informal leadership experience, were National Board certified, and/or had been participants in CTA's Institute for Teaching. Several expert teachers had also been union

representatives. The total corps of instructional leaders grew to 284 in the second year and was 267 in the third year. Between the first and the third years of the program, the proportion of coaches and Teachers on Special Assignment (ToSAs) increased from 7% to 18%, and the proportion of administrators grew from 8% to 15%. Figure 1 shows the proportion of educators in different roles within the ILC.

Figure 1
The Instructional Leadership Corps Members by Role



Source: Chart reproduced from SCOPE 2018 final report to funders.

To develop the leadership capacity of ILC members in those early years, the founding institutions convened regional and statewide conferences and provided access to experts and scholars in English language arts (ELA) and English language development (ELD), mathematics, and science, as well as leadership and professional development more generally. This work continues today: These experts contribute CCSS- and NGSS-aligned instructional strategies that can deepen student learning, and they share experiences in building relationships with key stakeholders such as district administrations, county offices of education, local unions, and funding sources. They facilitate encounters among teacher leaders and school and district administrators that lead to collaboration and co-planning, thereby creating a support network. The partner organizations maintain a resource repository and collect data for project development.

In designing and implementing the project, the founding organizations conducted a range of activities to identify accomplished educators, support them as they built ILC teams, offer professional development to team members, and organize statewide and regional conferences and presentations. Two examples are Learning From the Field in Phase 1 of the project and Sustaining ILC Work in the Field in Phase 2. ILC teacher leaders led workshops for their colleagues on how to

build effective partnerships—within ILC teams and between ILC teams and key stakeholders, in both urban and rural districts. Workshops also focused on how ILC professional learning activities can take root in local communities, including sessions on how to align ILC professional learning to districts' LCAPs and how to build a culture of instructional leadership. An important part of the agenda was to deepen ILC teacher leaders' own knowledge of the new standards and assessments.

The statewide and regional conferences also gave teacher leaders time to collaborate in teams and plan for the specific professional learning needs in their districts. In general, participants reported high levels of satisfaction with events offered by the project, particularly with the opportunities to collaborate and interact. For example, 95% of the 103 participating ILC leaders at the 2016 Summer Conference and 90% of the 173 participants at the 2017 Summer Conference found the event "very valuable" or "extremely valuable." Participants commented:

> Appreciate the time to plan and collaborate with colleagues. Thankful for the opportunity to network and share ideas/plans with others.
>
> This was a very informative and valuable conference. I learned a lot being a new ILC member. We had the opportunity to build more relationships and learn from other ILC members.
>
> Collaboration time within our Region II was most helpful (both among our team and then sharing and receiving from other teams). Workshops: Strengths-based was innovating and exciting. Science was clarifying and helpful.

Further regional breakout sessions convened teacher leaders to discuss challenges in their district contexts and share strategies for planning. The central project team continues to provide sustained technical assistance; it curates instructional resources and tools and maintains an ever-growing database for documentation and project development. Building on this knowledge, ILC teacher leaders conduct their own in-district, sustainable professional development to advance instructional capacity. Their activities build on and enhance teaching capacity in three core areas:

1. The California CCSS, NGSS, and accompanying assessments.
2. Pedagogy required to respond to the standards and thus ensure that all students are successful.
3. School- and district-based professional leadership activities that enhance, spread, and sustain the work of the ILC.

Professional development workshops (PDWs) are a hallmark of the ILC project. In these workshops, the teacher leaders put into practice principles of effective professional learning by supporting teachers as they develop knowledge and skills recursively and continuously in collaborative communities of practice.[21] Providing multiple learning sessions separated by opportunities for teachers to design and apply new strategies in their classrooms is a key element in helping teachers make lasting changes in instructional practice. This stands in contrast to single-session workshops, after which teachers may return to more familiar practices. Doing this work in collaborative teams increases the odds that teachers will be willing to attempt new approaches to instruction and to refine them with feedback and practice.[22]

In the first of two consecutive workshops, participants experience—rather than just observe—instructional strategies designed to deepen student learning. Focusing on an instructional shift represented by the standards in their subject areas, they study a concrete example of when this occurs (often with videotapes of practice). Then they consider their own students and collaboratively plan their own lessons to address this shift. They connect their professional learning to practice, paying attention to evidence of student learning. (See Appendix A.)

During the second workshop, participants analyze artifacts or samples of their students' work, discuss and reflect upon what they learned, and provide and receive feedback from colleagues for iterative improvement of teaching practice. At times, in subsequent sessions, ILC teams continue working with the same group of colleagues for longer periods to go deeper on topics of interest.

Most workshops focused initially on the instructional shifts associated with the CCSS in ELA and mathematics and, later on, shifts associated with the NGSS. Workshops took place primarily at district and school levels, but also at county, regional, and state levels. According to one evaluation report by Vital Research, a social science research organization, the impacts of the project in this first phase included greater awareness of standards, improved instructional practice, increased student learning, and empowered leaders.[23]

Some of these outcomes are likely due to the fact that the ILC's professional learning strategies are led by local teacher leaders who have expertise and the respect of their colleagues and who are responsive to the local district's specific needs. These local leaders are also familiar with—and thus can be sensitive to—the district's policies, politics, financial conditions, and other aspects of the context that can shape both standards implementation and professional learning.

The ILC project has moved on to Phase 2, now referred to as "Educators Educating Educators," with the primary goal of expanding to more districts throughout California and ensuring that the practices take root in local communities by deepening partnerships and garnering resources for sustaining its activities. As defined by the ILC, the project is taking root if and when the local community:

- increases fiscal commitment to the work;
- embraces and spreads the ILC work; and
- values ongoing teaching and learning as well as the knowledge and the expertise of teachers/practitioners in facilitating professional learning.

Local stakeholders work together to meet professional learning needs of educators, and ILC members deepen their own professional knowledge and skills when partnerships are functioning effectively and professional learning is deeply embedded, spreading from school to district and even to the state level.

ILC and systemic educational change

Teacher leadership can be regarded as an approach to systemic educational reform sometimes known as "leading from the middle," in which teachers and professional collaboration are centered as drivers of change.[24] ILC teacher leaders and site leaders have taken this approach to educational change through cross-role collaborations. They seek institutional partnerships and align with local initiatives and funding sources. The ILC's theory of action resonates with education researcher

Ann Jaquith's[25] framework for enhancing instructional capacity.[26] She argues that to provide high-quality instruction, districts and schools need to create opportunities for the development of professional knowledge, provide resources and materials, recognize instructional expertise, and build organizational structures that support teacher collaboration and trusting relationships.

International research underscores the importance of teacher professional collaboration. A survey of more than 100,000 teachers from 37 countries and jurisdictions found that when teachers have more frequent opportunities to collaborate, they are more likely to have confidence in their ability to manage a class, provide high-quality instruction, and engage students.[27] The same study found that teacher collaboration and feedback, including peer mentoring and coaching, was associated with greater job satisfaction and more active teaching practices that can engage students in project-based and technology-supported learning.

Harnessing and further developing teacher leadership is a key intention of the ILC project. Although teacher leadership is a variably defined term in educational literature,[28] here we refer to the many informal responsibilities that teachers take on in addition to their formally assigned roles and duties. These responsibilities may include sharing professional knowledge and pedagogical practices, building collegial networks that support colleagues' professional learning, and helping to develop collaborative professional cultures in schools.[29]

In some cases, given their understanding of the students' learning needs, ILC teacher leaders were able to align their activities with school and district improvement goals. In doing so, they boosted their own and their colleagues' capacity to make instructional choices and enhance their "decisional capital."[30]

Two tenets of the ILC are to provide professional development that is responsive to the specific needs of the local district and to have workshops led by local teacher leaders who have expertise and have earned the respect of their colleagues.

Two tenets of the ILC are to provide professional development that is responsive to the specific needs of the local district and to have workshops led by local teacher leaders who have expertise and have earned the respect of their colleagues. These local leaders are familiar with the policies and the politics, the financial conditions, and the labor relations in the district. At the sites we studied, teachers deepened their knowledge of the newly introduced state standards and assessments as well as of related instructional tools and strategies to support student learning. ILC team members assumed leadership roles, garnered resources, and forged partnerships within and across districts, with county offices of education, and with universities.

The ILC's Professional Development Approach and Impact

The ILC's approach to professional development differs from the single workshops prevalent in the past. ILC teacher leaders experience intensive professional development in annual statewide and regional ILC conferences and retreats and learn about the instructional shifts embedded in the new standards and how to transform classrooms to meet these shifts. Teacher leaders then return to their districts and provide PDWs to their fellow teachers.

This iterative process of learning, engaging, experimenting, reflecting, and refining practice is powerful. Because ILC members are still teaching and leading schools in their districts, the techniques and skills they have learned—and are now sharing out—take root in department and team meetings, individual classrooms, and other professional development settings.

Teachers have embraced this process. The ILC efforts have been warmly received by teachers and school leaders. Post-workshop surveys of thousands of participants show that large majorities of educators consistently report that their ILC experiences have influenced their curriculum, instructional strategies, assessments, student engagement, and student learning to a "great extent" (well above 4 on a 5-point scale). They also consistently reply that the workshop sessions were "very" or "extremely" helpful to them, giving them information and tools they can and have used to make instructional or leadership shifts.[31] These kinds of comments are common:

> Learning a strategy to implement an ELA shift in my classroom the next day made me try it out. Knowing that I was expected to bring student work to follow up made me feel accountable, so I did the lesson. Having [the ILC member] at school where I could ask for help made my try at the shift more successful. Getting the document that showed how the shift applied to standards at my grade-content level helped me plan how to apply the shift without needing to do lots of finding on my own. This was the most useful PD I have had in years. Thank you.

> This is PD at its finest, when the teachers walk out both inspired and motivated to attempt to replicate what they saw. Kudos to ILC for empowering teachers to teach teachers. I've never walked away from consultant-based training with the same fervor or resolve.

> I'm excited about teaching new/challenging vocabulary to my students. Kudos for the presenters!! Great job! Very interactive, loved the best practices shared and collaborating with teachers from other schools. This was an awesome professional development. It was great to share lesson ideas with teachers from other schools. I would like another PD like this one!

The ILC's reach has been extraordinary. Between November 2014 and September 2018, in more than 2,000 schools and at least 495 districts in California, ILC leaders provided multisession professional learning workshops to more than 32,000 educators statewide to support the implementation of the CCSS. According to a survey of ILC teacher leaders, "Over 85% of respondents felt that their participation in the ILC had influenced student learning to 'a great extent' or 'some extent.'"[32] Close to 30,000 educators participated in ILC-related conferences and presentations, and an additional 38,000 were indirectly affected as ILC members trained instructional coaches in a trainer-of-trainers model.[33]

The project and its members have gained increased visibility. In California and nationwide, various publications, presentations, and conference participation by members have expanded the ILC's exposure and renown. ILC educators have taken on different roles and responsibilities at all levels of the education system. Since 2017, the project has added two more goals for the future: to reach districts in historically isolated regions of California and to help the project take root in districts in which activities have been ongoing.

Studying the ILC in Four Contexts

Several organizations have documented and monitored the ILC's work and provided information and formative evaluation for its continuous improvement. SCOPE regularly collects evaluation data from participants in the ILC workshops and other learning activities and uses those to improve the program each year. In addition, Vital Research[34] conducted an early evaluation of the program to examine its reach and impact.[35]

Our study sought to learn how ILC teams in four different settings gained traction in their communities and began to transform professional learning opportunities in their regions of the state, often addressing long-standing problems of practice and inequities in children's access to high-quality instruction. We investigated the work of ILC teams in Madera Unified School District in California's Central Valley, the East Side Alliance in Northern California, Conejo Valley School District in Southern California, and an ILC teacher leaders' network in North Orange County connected with California State University, Fullerton's College of Education. The four cases represent four distinct regions and contexts.

The case of Madera Unified School District illustrates how ILC leaders find ways to respond to students' learning needs in a low-income, rural community in California's Central Valley. In Madera USD, 90% of the students are eligible for free or reduced-price meals. In 2017, when data collection for this study began, 88% of students in the district were of Latino/a heritage. English language and literacy development was one of the district's key goals, which guided much of the ILC's work in this district.

The East Side Alliance, an educational partnership between a high school district and its seven feeder districts in Silicon Valley, represents a set of districts serving 82,000 students from both affluent and low-income families. We examined the activities of two ILC teams from two different districts, focused on successful implementation of the CCSS with emphasis on mathematics and bolstering African American and Latino/a students' high school graduation rates.

Conejo Valley School District, located between Ventura County and Los Angeles County in Southern California, is well resourced and recognized as a high-achieving district. Around 67% of Conejo Valley students met or exceeded state standards on the California Assessment of Student Performance and Progress (CAASPP) in 2016–17, compared with 49% statewide.[36] Although science achievement progressively rose on state assessments from 2005 to 2013,[37] the community urged the schools to continue their focus on raising science achievement across all grade levels. This is a case in which ILC teacher leaders invested effort in creating vertical alignment for teaching inquiry-oriented science across all school levels.

The North Orange County network was created by ILC teacher leaders from different districts around California State University, Fullerton. Their activities expanded beyond the initial goal of the ILC project, as they focused their efforts on strengthening and diversifying the teaching profession in the region. This case illustrates the power of professional networks and the benefits of building strong relationships with an institute of higher education committed to teacher learning along the professional continuum, from pre-service to professional development.

Given that practitioner-led professional learning has often failed to gain a toehold in districts in which teacher leaders are appointed but not integrated into the work of the schools,[38] we wanted to understand what has enabled the work of the ILC to grow and become rooted in various

communities. We examined the strategies used by ILC leaders both in conducting professional development and in connecting their work to the broader efforts of their districts and counties. We examined the perceived impacts on practice for teacher participants and, more widely, for the nature of practice in schools, districts, and, in some cases, counties.

How the research was conducted

In the four case studies, we describe and analyze the activities of the ILC teams and their impact on teachers' and students' learning in the respective sites. Site selection began with discussions among the researchers, SCOPE staff, and CTA representatives. From a list of 24 ILC teams, we selected four sites based on the following criteria: (1) the project had reported success in having taken root in the district; (2) the number of teachers reached by the ILC team was above average; (3) feedback from teachers participating in the ILC project was highly positive; and (4) sites varied on features of student demographics, geographic distribution, and engagement with local organizations.

We visited each of the four sites during 2017, conducted interviews of 28 teachers and 12 school and district administrators, plus performed additional follow-up interviews by phone as necessary. We observed two ILC regional conferences and seven ILC PDWs. We observed the classrooms of four teachers who participated in ILC workshops. We used Dedoose qualitative software and a combination of inductive and deductive coding to analyze the interviews. Extensive survey data collected by SCOPE supplemented the interviews and the data from the observations. We had access to a range of additional artifacts such as videos and video transcripts produced by the ILC project, resources and presentations from ILC workshops, planning documents, and various project reports.

The structure of the case studies

The four case studies describe the respective ILC teams' activities and accomplishments. We note the different contexts and the conditions—rural, urban, and suburban—in which ILC teams worked. We describe how the teams developed a professional learning agenda targeted to be responsive to students' and teachers' expressed needs. We discuss how the teams learned from early experiences and challenges, elaborated their work, developed leadership skills, and built relationships with colleagues and partner organizations to help sustain and embed the work in their locales. We propose major takeaways from each of the cases and include a brief update on the current work of the ILC teams.

To conclude, we look thematically across all four cases to identify lessons learned. These lessons may be of value to policymakers and educators interested in broadening and deepening teachers' professional capacity in California and other states.

Chapter II: The Instructional Leadership Corps in Madera USD: Promoting Language Development

> All students are language learners.... When you start talking about things like "integration," and when you go on to higher levels like differential equations, abstract algebra, how do [they] know what you're talking about?... So we better teach them. And it's our responsibility to teach them. One of the comments I heard from a middle school teacher at one of my previous sites was, "I teach science, not language." And I just about lost it.
>
> Jacob Mortier, Madera USD

In his presentation, Jacob Mortier was sharing with colleagues his passion for teaching mathematics and his commitment to supporting students' growth and development of mathematics-specific discourse. His insistence on language development for all students is a touchstone of the work of Jacob and his colleagues, members of the ILC in the Madera Unified School District.

About Madera Unified School District

Madera, named for the Spanish word for lumber, is a town of approximately 64,000, with a population that has grown by more than 40% since 2000 and doubled since 1990. Founded by the California Lumber Company in 1876, it was later incorporated as a city in 1907. It is primarily a hub for the farming and agricultural sectors, with employment opportunities in manufacturing and food processing as well. The estimated median household income in 2016 was $40,034. About one in four people in the county lives in poverty.[39]

Within a few months of the town's founding, citizens attending a public meeting decided to build a school. However, the Madera Unified School District was not incorporated until 1966. At the time of data collection for this study in 2017, Madera USD had 20,284 students enrolled in its pre-k through 12th-grade programs. It consisted of 26 schools and was in the process of building a new elementary school and high school. The district had 17 elementary schools and one preschool, three middle schools, one alternative high school, two comprehensive high schools, one community day school, and one adult school. Madera USD had an annual budget of $240 million. As of 2017, 88% of students claimed Hispanic or Latino/a origins.

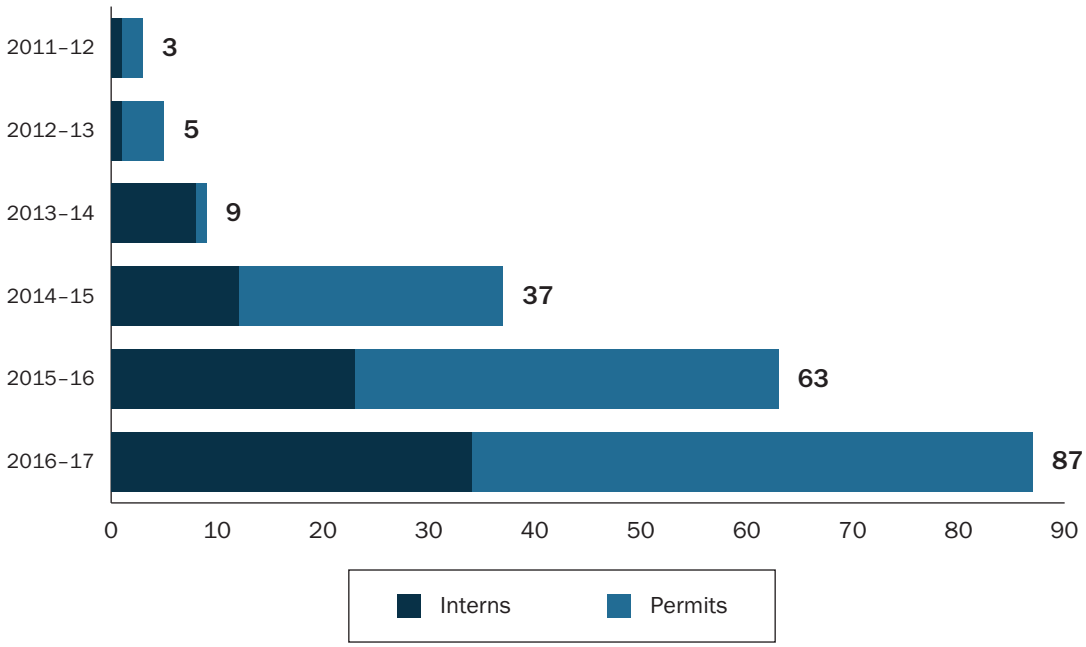
As is the case in many rural districts across California's Central Valley, a large proportion of the student population lives in poverty. In Madera USD, the proportion of students eligible for free or reduced-price meals is close to 90%. Also, in many of these districts, students enter school—and at times exit school—classified as English learners (ELs). In Madera USD, 31% of the students were classified as ELs and 28% as Fluent English Proficient (their primary language is not English). Among ELs, Spanish is the primary language of most students and is the primary language of approximately 30% of all students. A further 1% of students speak Mixteco, Arabic, or Punjabi.[40]

Teacher supply and demand

Like many high-poverty districts in the state, Madera USD has been struggling with teacher shortages and high levels of teacher turnover. With the Great Recession that began in 2008, the district laid off a significant portion of the teaching staff and has struggled to recoup those losses.

Subsequently, when the recession ended and the district had funds for new hiring, there was a major teacher shortage underway. Thus, the district found it needed to hire large numbers (according to one administrator, "near historic levels") of teaching interns and individuals on emergency permits and waivers. Many of those hired by Madera USD were teachers who were not fully certified and who had little or no experience. Some were industry professionals looking to make a career change, and others were recent graduates, new to both teaching and a full-time profession. At the time of data collection for this research (2017), more than 10% of the approximately 1,000 teachers in the district had 2 years or less of teaching experience,[41] and nearly 7% of teachers held a temporary teaching credential when we visited the district.[42] (See Figure 2.)

Figure 2
Teacher Supply: Interns, Permits, and Waivers in Madera USD (2011–17)



Source: California Commission on Teacher Credentialing. (n.d.). Teacher supply: Interns, permits and waivers. https://www.ctc.ca.gov/commission/reports/data/edu-supl-ipw.

Teacher retention was another ongoing challenge for Madera, with the district typically employing 50–100 new-to-the-district teachers each year. One administrator estimated that around 70% of the teaching staff lives in nearby Fresno, a large city approximately 35 minutes away. While teacher retention was somewhat buoyed by strong union benefits packages, local administrators recognized the importance of creating a supportive environment to keep teachers engaged. As one noted:

> If we're not careful about how we value our teachers, they'll find another place to work that's more comfortable. This is not an easy place to work. It is not an overly difficult place either, but I recognize that the arc of education is to go from a limited-resourced school to a better-resourced school, to work with more challenging students, and then, as time goes on, to find a place to work that is less challenging.

The Madera USD educators we interviewed acknowledged the role of the teachers union in attracting teachers to the district. One educator stated:

> Madera's compensation is equal to or better than outlying counties, both at the teacher level and at the administrative level. We have, I think, the best benefits package in the San Joaquin Valley, as far as health insurance goes.

A teacher who had formerly taught for 10 years in two charter schools in East Los Angeles and was new to the district appreciated the support of the Madera Unified Teachers Association (MUTA): "Knowing that they're there for me has made me feel safe in my job because at my previous charters in L.A., the response was, 'If you are not happy, just leave.'"

A veteran educator in the district who was recruited to join the ILC had a more extended perspective. He spoke passionately about labor partners in advancing education in Madera:

> I was approached to be a member of the Instructional Leadership Corps by Amanda Wade, our Union Vice President here at Madera, and our Union President. I'm guessing it was because they realized that over time, I've expressed and lived that I value labor partners in the modern conception of them in education. My parents were both members of our union when they were teachers in this district. My aunt was a member of this union when she was a teacher in the district. Obviously, the union has lots of different leadership changes over time, but the fact that my family was part of this and part of the reason I'm as healthy as I am … was because I had great health care as a kid because my parents were members of the union.
>
> In the end, we are only here for a short amount of time, and part of our life's work is to make things better for kids. While we are all doing that, there should be less to argue about than there is to agree upon. When we can bring people in and empower them to do good things, then we have the chance to make things a lot better a lot faster with a lot more consensus.

The importance of language instruction

In Madera USD, as in many districts and schools with large percentages of ELs, students' language development is a serious concern. Teachers we spoke with indicated that language development is an issue not just for ELs in their school but for all students.

Language and literacy development has indeed been a key educational aim in Madera USD. According to the district's website, approximately 32% of students in the district were meeting or exceeding state standards in ELA in 2017, compared to 49% statewide.[43] One administrator described the need for greater literacy as a barrier to achievement across subjects:

> The greatest [need] I saw was the … ability to read at a high school level. In particular, when we started looking at the high school exit exam, I kept trying to tell everybody, "This isn't about the English standards. This is a reading test." Our students had a hard time accessing the test, let alone answering the questions, because they couldn't read the test.

Some students are newcomers, and some have no prior schooling experience. One of the teachers spoke poignantly about students in his classroom:

> We had kids who had never been in school. Their family moved to the United States, they're 14 years old, and their first experience is to walk into my class first period and have to do math and not be able to communicate. So I really emphasized that we need to support teachers, to support kids [and help them learn] how to communicate.

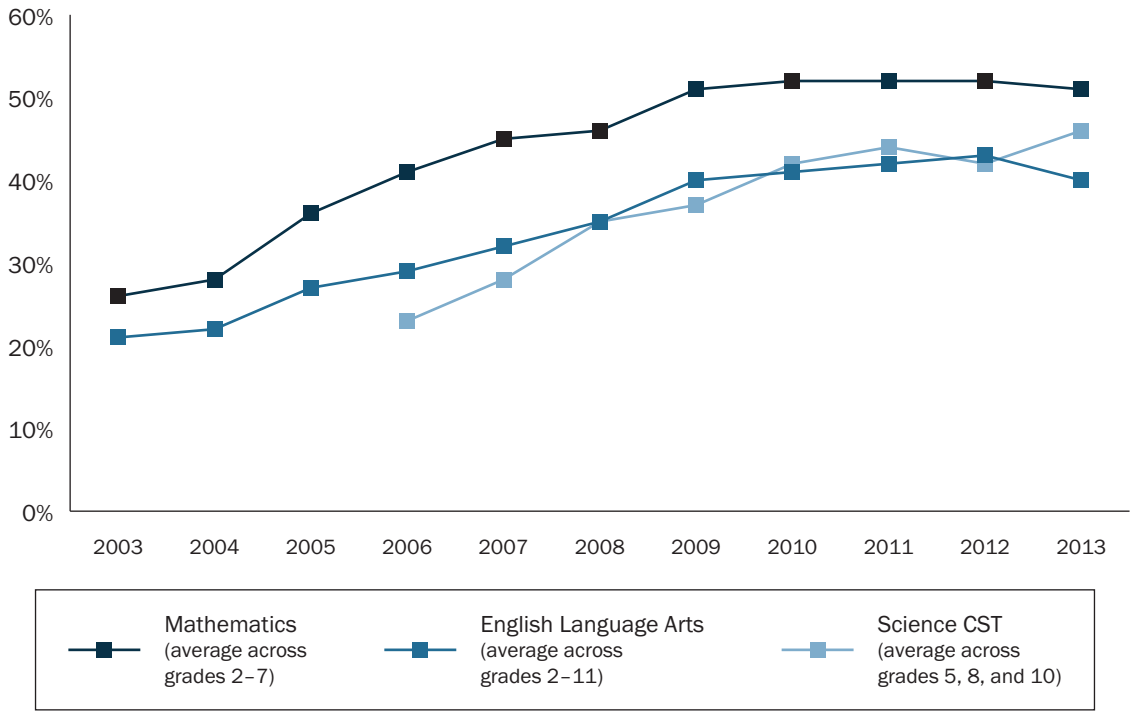
Administrators with whom we spoke noted the increased importance of language, literacy, and technology skills in both the local and wider workforce. As one administrator noted:

> We are becoming a service-oriented economy. There are still the plumbers, and cement makers, but by and large, you've got to read to be able to function in our society. Even if you are choosing a career over college, you've got to be able to read. I was talking to a farmer, and he says, "You know, it used to be I could hire a kid out of high school, and put him in a tractor, and turn him loose. I can't do that anymore. The rig costs a quarter of a million dollars, and it's computer aided." The kid who runs the tractor now has to be able to read and have computer skills. That's just the bottom line. Our economy has changed rapidly, and we have to figure out a way to help these kids acclimate and keep up.

A Changing Landscape

Madera USD has seen several shifts in student learning outcomes over the past 15 years. Scores on the California Standardized Testing and Reporting (STAR) examinations in ELA improved from 2003 to 2010, with the proportion of students scoring at proficient or advanced levels doubling from 21% to 42%, plateauing, and then dipping slightly. A similar trend was seen in mathematics (averaged over grades 2–7). In science (averaged, from 2006, over grades 5, 8, and 10), there was an uptick in performance in 2013 after a brief decline.[44] (See Figure 3.)

Figure 3
Madera USD Proportion of Students Scoring at Proficient Level, California Standardized Tests (2003–13)



Source: California Department of Education. (n.d.). Standardized Testing and Reporting (STAR) results. https://star.cde.ca.gov.

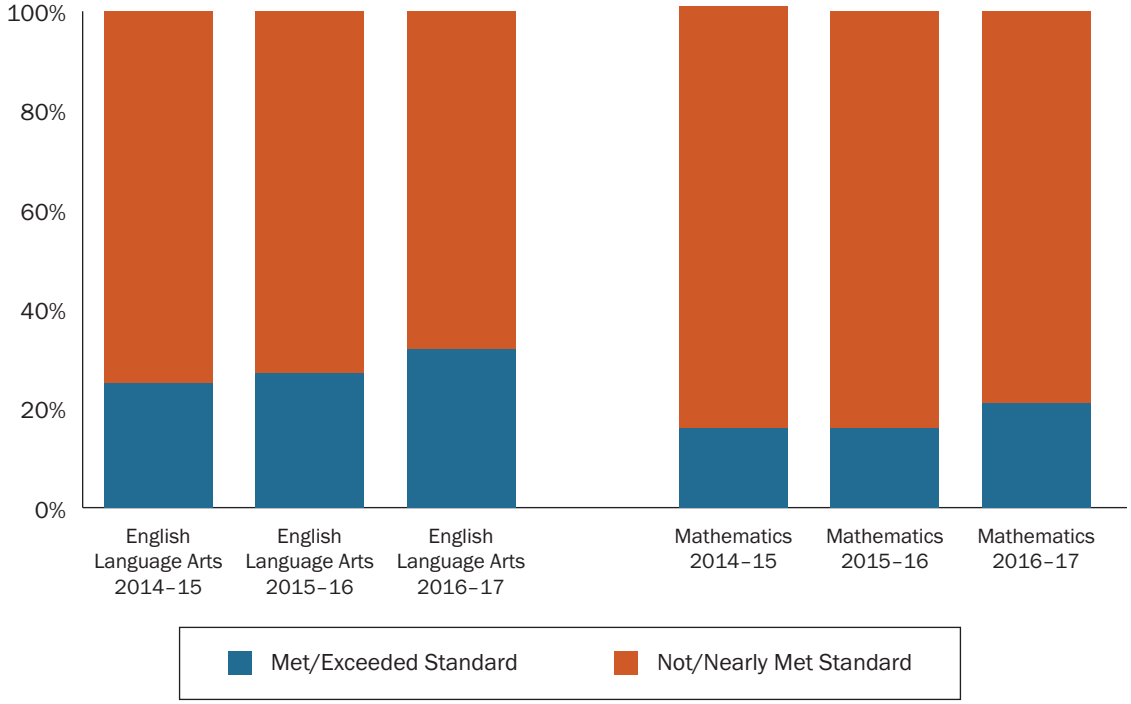
State data also show that the 12th-grade cohort graduation rate rose from 79% to 91% from 2009–10 to 2015–16, while the dropout rate fell from 15% to 7% over the same period.[45]

With the purpose of improving student achievement, and in response to accountability measures and pressures, Madera USD, like many other districts nationwide, had invested in highly structured, tightly sequenced, skill-based, teacher-led instruction using mostly lectures or demonstrations. The district adopted and implemented various programs, among them Explicit Direct Instruction (EDI), a methodology strongly rooted in teacher-centered instruction. EDI, interpreted as scripted lessons and pacing guides, became commonplace in most classrooms in the district. "Teachers were whipped into shape by EDI," said one of the district employees regretfully.

Scores on CAASPP in Madera USD for the 3 years from 2015 to 2017 show that the proportion of students in grades 3–11 who were meeting or exceeding standards in ELA inched up from 25% to 32% (compared with 49% statewide) and in mathematics increased to 21% (compared with 37% statewide). (See Figure 4.) This small but steady increase in the proportion of students achieving proficiency coincided with the start of the ILC's activities.

Going forward, an improvement in student achievement on the new assessment system would require a change in how students learn and teachers teach.

Figure 4
Madera USD CAASPP Scores (2014–15 to 2016–17)



Source: California Department of Education. (n.d.). CAASPP test results for English language arts/literacy and mathematics. http://caaspp.cde.ca.gov/sb2017/default.

From Explicit Direct Instruction to Common Core

Since 2014, a watershed year in Madera USD, teachers, administrators, and students have seen a sharp change in the curricular and pedagogical thinking in the district. In the prior decade, EDI was the dominant pedagogical strategy. Madera USD required teachers in EDI to implement a common cycle across lessons and classrooms, as well as pacing guides so that teachers moved through the curriculum at a common rate. As the data in Figure 3 show, although there had been increases in student performance on California's previous standardized tests from about 2001 to 2010, it had plateaued between 2010 and 2013.

Like many teachers in other districts nationwide, teachers with whom we spoke indicated that the highly structured, seemingly inflexible approach that the district prescribed until 2014 constrained them to work through curricular material at a rigorously delineated pace, regardless of whether student learning was keeping pace. Administrators expected to walk into classrooms and immediately recognize what teachers and students were doing. One veteran teacher noted:

> We were in the EDI phase for so long with the [California] standard test, the CSTs, and everything was so regimented, and they expected to walk from one class to the next to the next and see the exact same thing.

Another teacher characterized the teaching required of EDI as incompatible with CCSS, adding that this was a paradigm shift for both teachers and students:

> Each of us cannot do what is inherent in the Common Core within EDI mode. So the shifting standards really opened that window up for us. It also meant we did not really have teachers trained or kids trained. Our students believe there is one right answer, the teacher has it, and if they wait us out, we will give it to them. Shifting to student sense-making is a pretty big shift for the kids.

A change in district leadership supported the change in the previous academic practices. Driven by the CCSS and NGSS, new leadership at Madera USD looked for opportunities to align how students learned and how teachers taught with the new standards.

Feedback to teachers and evaluations of teaching needed to shift as well. Although some veteran administrators and teachers seemed reluctant at first, the new district leadership made the expectations for this shift clear. Referring to these recent changes in a districtwide workshop, a former teacher, currently an administrator and an ILC member, said:

> Recent evaluation criteria are so different for the walk-throughs because we want to slow down, we want to know what kids actually know, not move on. Teachers turn in pacing guides to me and I never look at them. I do not care. I want to know what the kids are learning. I say, "Here is your target. You are the professional. Figure out how to get there." Pacing is detrimental.

Curriculum and professional development

Adoption of the CCSS and NGSS triggered ambitious, profound, and demanding shifts in curriculum and pedagogy. Moving from scripted curriculum and pacing guides to planning lessons with engaging learning activities was not quick or effortless. The new standards promoted and recommended increased peer interaction and authentic communication among the students. Students were to read, interpret, and analyze complex texts and write short responses and final unit essays. The new standards emphasized the development of students' oral and written proficiency in English, the language of instruction, as well as competencies in subject-specific academic discourse.

Rather than lengthy lectures, scripted questions, and demonstrations with predetermined results, teachers had to orchestrate the students' interactions with each other; ask open-ended, higher-order questions; and be ready for sometimes unexpected or unpredictable answers. They needed to provide timely and judicious feedback and design their upcoming lesson plans based on their analysis of what the students had learned and accomplished to date.[46]

The kind of professional development offered to teachers, as well as the district's professional learning policy and funding environment, had to parallel and support these classroom-based curricular and pedagogical shifts. With that, the multiple demands significantly affected the various stakeholders and posed serious challenges. One administrator, responsible for the induction program, described the situation as follows:

> Until 2008, part of the induction requirement was professional development, and a certain amount of hours went with that. You had to document how many hours you went to professional development. Then the funding changed, and the

> requirements changed, and they removed that requirement because paying for professional development was expensive, so there was not—for many years—a professional development requirement. It was a suggestion, and there is the offering, and a menu of options to choose from, but it was not a requirement. Then, they changed the rules again, but they did not change the funding.

Another administrator described competing demands and said that efforts to upgrade the district's educational technology had come at the expense of resources for the curriculum and instruction team, leaving it unable to support teachers effectively. Administrators recalled that some teachers were frustrated that the district's approach to curriculum was in flux. More pointedly, a senior administrator described the uncomfortable tension in finding the balance between giving teachers freedom from the rigidity of the EDI approach and giving them guidance and support required for the necessary pedagogical shifts. The interim superintendent expressed his concern about whether the teachers were prepared enough to address these serious demands if they did not receive adequate professional learning.

> One thing that I have heard periodically from some of our teacher leaders is, "Hey, we teachers know what to do. If you just leave us alone, we'll do it." Well, there are no results that show that that is true right now. In fact, in a lot of places where our teachers are not being well led by administration or by teacher leaders, we're seeing declines because in this environment, teachers don't just inherently know what to do. This is very rigorous curriculum, especially when we are talking about math in particular and English language learning. It's a fallacy to engage in that line of thinking very far.

The Instructional Leadership Corps in Madera USD

The ILC was one of several initiatives that emerged in response to these district needs. The Madera ILC team began its work in 2014–15 with three members: Linda Tolladay, Jacob Mortier, and Amanda Wade. Linda and Jacob were middle school teachers (science and mathematics, respectively) and served in a think tank associated with the CTA in Fresno. Amanda was an elementary school teacher who had been on assignment as a reading specialist. By spring 2017, two other educators joined the ILC: Todd Lile and Berta Cisneros. Todd was the district's Chief Academic Officer (CAO), subsequently appointed as Interim Superintendent, and currently Superintendent of Madera USD. Berta was the English Learner Coordinator (Secondary) for Madera USD.

The formation and growth of the Madera ILC team and its professional learning initiatives illustrate the powerful impact when motivated individuals connect to leverage teacher knowledge simultaneously reinforced by district policy and CTA backing. In this section, we describe how the team members became connected, created their initial ideas, and iterated upon these to shape teacher learning districtwide.

The formation and growth of the Madera ILC team and its professional learning initiatives illustrate the powerful impact when motivated individuals connect to leverage teacher knowledge simultaneously reinforced by district policy and CTA backing.

The Madera ILC team began as two separate entities, but they combined their efforts after the first year. The impetus for the merge came from existing district and CTA initiatives relating to CCSS implementation. The teams were formed with the assistance of the local union organization, the Madera Unified Teachers Association (MUTA), which helped them tap experienced teacher leaders to become ILC members. The elementary representative, Amanda Wade, who was a local union official, had 15 years of teaching experience and had previously been involved with a CTA leadership development program, an initiative that preceded the ILC. Focusing on elementary schools, Amanda worked as a one-woman team for the first year of the project.

At the secondary school level, Linda Tolladay, with more than 30 years of middle school teaching experience, had recently been invited to participate in the CTA's Institute for Teaching, a think tank that supports teacher capacity via regional hubs, the nearest located in Fresno. The idea of building teacher capacity through participation in the ILC resonated with the institute: "The principles of the ILC mirrored precisely the sort of work we were already thinking we wanted to bring to the Central Valley," she said.

Linda had also been nominated as the science representative for Madera's Common Core Steering Committee, a joint initiative between MUTA and Madera USD. Through these meetings, she connected with Jacob Mortier, a mathematics steering committee representative from another middle school across town. The Steering Committee was a new district initiative set up to roll out the CCSS. Committee members were charged with forming relationships with other teachers, meeting several times a year, and supporting them in CCSS implementation. The demand for quality professional development was high and urgent and had to be responsive to teachers' needs at the various grade levels. As Jacob described:

> We were shifting to Common Core to bring … all the math teachers together and be able to discuss what's going on in the different sites, how we're trying to progress. I met with middle school teachers six times a year during their "early out" planning session, and my job was to bring them together and organize presentations or information.… [Then] I'd go and meet with the high school math teachers and do the same thing. What did they need and what can I provide to help them? And each group was different. The high school teachers just wanted me to show them strategies, whereas the middle school teachers … wanted to be able to collaborate and share what they were doing in their classrooms.

Joining the ILC provided opportunities for Linda and Jacob to connect their discrete efforts as part of the Steering Committee. They had established reputations in their schools as effective educators, but although they were aware of each other by reputation, they were not well acquainted. As Linda notes, the ILC enabled them to connect, develop a personal relationship, and discover that they shared a commonality of purpose:

> We taught at two different middle schools, so our first meeting was actually our long car trip down to Los Angeles for the first convening of the ILC. We got to know each other pretty well in that 5-hour car drive, and we found that we both wanted to do very similar things in our district.

At an initial ILC conference, the newly formed two-person team learned how they could transform this enthusiasm into impactful action. As Jacob described, it also provided inspiration for the team members to connect their energies and ideas to those of other educators in the state:

> It was just amazing to see the passion, because you know, there are passionate people in Madera, but to get 100-plus people who were all so passionate about kids and education, it was just powerful. That was how I first got introduced to the ILC, and it's been amazing ever since.

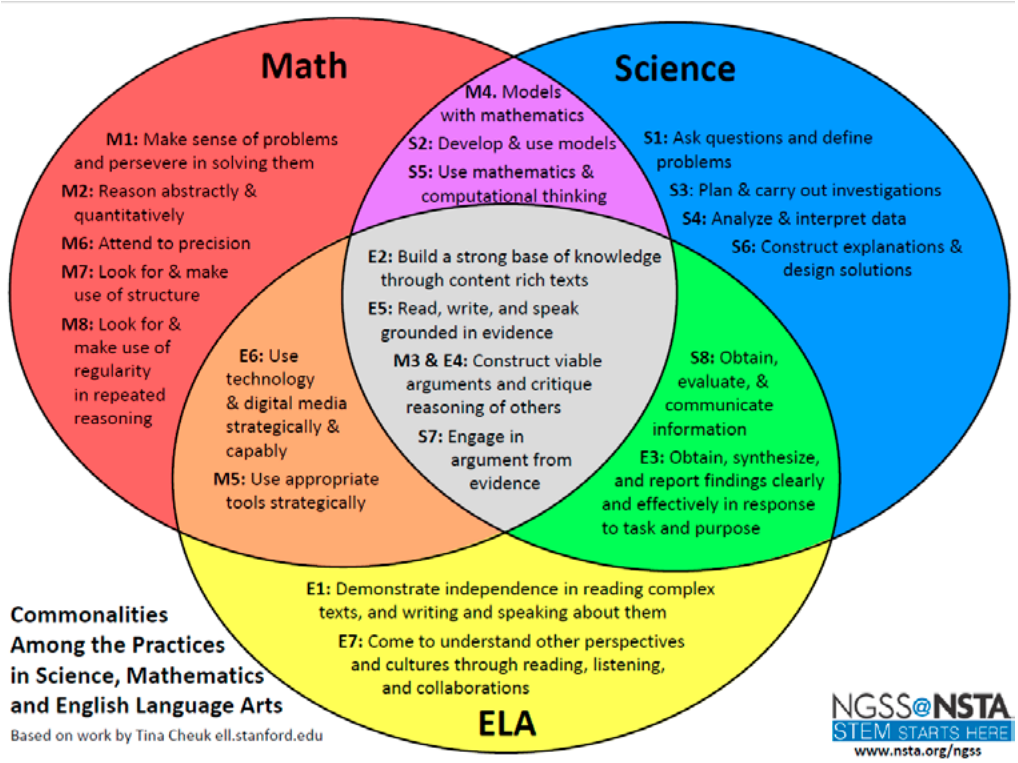
Professional development in response to local needs

The new standards emphasized the need for classroom conditions that create opportunities for all students to develop oral and written language proficiency and discipline-specific discourse—"academic language," in the current educational parlance—and engage in well-designed learning and teaching practices to master subject matter content. Educators were tasked with designing new curricula, new kinds of assessments, and new professional development approaches. The Madera ILC team members responded to this call with their community's specific conditions and their colleagues' particular needs in mind.

For all team members, the determination of focus areas for PDWs began with an examination of the discipline-specific practices in the new standards and with a serious consideration of both student and teacher learning needs. To leverage their strengths in different subject areas, the team members looked at the standards' commonalities and even areas of overlap. Initially, they settled on "evidence-based reasoning and argumentation." As Linda, the science teacher in the team, explained:

> There is a three-circle Venn diagram. We looked at that thing and said, "So I'm a science teacher, he's a math teacher. What can we do together for all our teachers? There, in the sweet spot, is arguing from evidence."

Figure 5
Common Practices in the Language Arts, Mathematics, and Science Standards



Note: Each number and letter in the diagram represents a mathematical practice, science and engineering practice, or English language arts student portrait associated with the standards. See http://static.nsta.org/ngss/ExplanationOfVennDiagram.pdf.

Source: National Science Teachers Association. (n.d.). NGSS tools. https://ngss.nsta.org/ngss-tools.aspx.

The team also knew that students needed to develop foundational knowledge and skills that teachers must, in turn, incorporate into their teaching repertoires. The pair also knew that this would require some backward mapping. As Linda noted:

> If we want the kids arguing from evidence in May, what do they have to do in September? We said, "They have to just be able to talk to each other at an academic level." We've got to raise that level of discourse.

In considering the students' and teachers' specific needs, the Madera ILC team members realized that—in addition to a significant proportion of designated ELs, some of whom were new immigrants and might never have attended school previously—most students needed to be able to develop subject-specific discourse to be successful in following the new curricula and assessments. They thus shifted their initial ILC work program and embarked on a program to train teachers in how to develop and support students' academic language competencies. As Jacob noted, if taught well, academic talk could be a foundation for learning across subjects:

> Our big goal was communicating that whatever you're teaching can go to every single subject if you're teaching the language first. And then the content is almost secondary. Because if they can't articulate what they're talking about, the content will never take shape.

The ILC team members drew upon their professional and personal experiences and backgrounds to develop the workshops: Jacob is Spanish-English bilingual and has a background in English language development (ELD) in mathematics. Linda has taught overseas and worked with ELD. They put together the key elements for fostering academic language development, including classroom norms for productive discussion and sentence frames to help scaffold academic conversation. The workshop materials included examples of sentence frames shared by Kate Kinsella, a teacher educator at San Francisco State University. (See Appendix B.)

Academic talk in Madera middle schools

Having decided to focus on academic talk, the ILC team set out to plan the PDWs. As experienced teachers and to model the kind of pedagogy promoted by the new standards, they structured the workshops as a balanced mix of short, interactive lectures supported by PowerPoint slides and of multiple opportunities for participating teachers to engage in small group discussions. This format incorporated the ILC's workshop essentials. (See "ILC Professional Development Workshop [PDW] Essential Elements.")

ILC Professional Development Workshop (PDW) Essential Elements

- Choose the instructional shift you will demonstrate in Session I.
- Use the Planning Your Professional Development Workshop Session I document as a set of planning principles for designing an experience of the instructional shift that you will model for participating teachers.
- Lead participating teachers through an experience of this instructional shift.
- Give participating teachers a concrete example of what occurs when students learn content with this instructional approach.
- Using the Instructional Thinking: Considering the Four Domains document, facilitate a conversation about how well the lesson that participating teachers just experienced attended to these four domains. Discuss what else would need to occur to enact this instructional shift in their individual classrooms.
- Ask participating teachers to consider their own teaching context. Where do their students particularly struggle? How well does this particular instructional shift address what their students are struggling to do? If not very well, what instructional shift or move would better meet their students' needs?
- Ask participating teachers to select an instructional shift to try out in their own classrooms. Have attending teachers use the Selecting and Using an Instructional Shift in My Classroom document to plan to teach the selected instructional shift in their classroom.
- Facilitate a conversation among attending teachers about what artifacts of student learning they can bring back to Session II to see what happened as a result of trying out this particular instructional shift in the classroom.

Source: From ILC materials, "For Teachers: Essential PD Workshop Components." A more complete list is part of Appendix A.

A typical after-school workshop that we observed started with greetings by Jacob, the primary presenter that day; short introductions by the participants, including name, school, and subject matter; and announcements about logistics (e.g., how to sign up for professional development units, get a stipend, and enroll in the online course on academic language development sponsored by San Diego State University and offered through Google Classroom). Then Jacob set the stage for the day's activities. Jacob and Berta distributed the group tasks and resources, and teachers began analyzing the handouts, proposing ideas, and exchanging experiences. After a short break for dinner (sandwiches and drinks provided by MUTA), the second part of the workshop followed a similar structure: a short, interactive lecture that built on the content of the first part of the workshop and another group activity. Before the end of the workshop and after a short debrief, the presenter urged the teachers to try out, as soon as possible, some of the new instructional strategies presented. The presenter also encouraged the participating teachers to send emails with questions, to share experiences among themselves, and to visit each other's classrooms.

Key elements in these early workshops were strategies for giving students more opportunities to participate and talk in class. "The person doing the talking is the one doing the learning," said an ILC member in a presentation we observed. Rather than asking the students to be quiet so the teacher could talk, students were to be actively engaged and talking.

Practice in getting students to talk was supported with sentence frames for students to present an opinion, acknowledge ideas, seek clarification from a peer, or constructively disagree and suggest. The accompanying handouts also showed how the structures could build across grades, from those in kindergarten and 1st grade ("I think…, because…"), to more advanced ones in 6th grade and beyond ("Based on…, I infer that…").

Academic talk workshops were first offered in January 2015 at the two middle schools where Linda and Jacob taught. The first was held at the middle school where Jacob worked. Forty-three teachers attended—the entire staff of the school. The same day, a second session was run at Linda's middle school and attended by 56 teachers. The events were supported by the principals, who made the time available to the pair after having participated in an ILC-led workshop themselves. As Linda noted, a key element to getting the first workshops off the ground was the strong reputation they each had within their schools:

> The reason we were able to do the in-service the first time around is because both of us had developed strong enough relationships with our principals so that we could go to our principals and say, "Hey. We have this thing we want to do with all the teachers, and it will be really good, we promise." We didn't present it like that, of course. We had our justification and explained the Venn diagram and why we thought this was useful. But we had enough of a reputation with our principals for that to be something they were excited about offering.

With only three middle schools in the district, news of the workshops quickly spread to the third school, and its principal invited the team to present there as well. A few weeks later, Linda and Jacob repeated the workshop at this school. Follow-up workshops that built on the initial workshops were conducted in February 2015, and with the support of the three middle school principals, the pair

was then able to distribute supporting resources to all teachers: posters with the newly introduced classroom discussion norms and hard copies of the sentence frames for every classroom across the three schools.

The follow-up with the teachers was an important element to the success of the ILC team in this first year. The pair conducted an additional workshop in May 2015 and connected with teachers individually to reinforce the learning. They communicated with the teachers via email, at times were able to visit classrooms, and made great efforts to check in periodically. Feedback from teachers who participated in the workshops was positive. When teachers were asked in post-workshop surveys how likely they were to enact instructional shifts, on a scale of 1–5, participating teachers reported averages of 4.46 and 4.38 from the January workshops and 4.37 and 3.95 from those in February.[47]

Teachers also had opportunities to observe the teaching of academic talk. In the first year, Amanda, the third ILC member in the district, embarked on a similar project to promote collaborative conversations among students in her role as a reading specialist. As such, she sent teachers to observe Jacob teach at his middle school. As Jacob noted:

> I was sharing some of the things I was doing in my classroom, and the next thing I knew, every single week [Amanda] was sending teachers over into my room. So, my kids got used to—2 or 3 days a week—people walking in and just seeing what we were doing.

In 2015, the reports of successful PDWs in the middle schools attracted the attention of Todd Lile, then the district's CAO, who joined the ILC team the following year. He saw this collaboration as a potential mechanism to deepen professional learning in the district, noting:

> [The ILC team members] had lots of follow-up with their original trainees in the prior year, and the feedback they got was really overwhelming.… [It] is strange to imagine that a teacher at Thomas Jefferson and a teacher at Martin Luther King [not only] had credibility at both of their sites, … but also had credibility at each other's school sites and at a [third] school where they didn't teach because of their reputations. These three principals interacted with each other all the time. They set the model for our district in terms of collaboration, and I really doubled down on that.

Todd, who was subsequently appointed Superintendent, also reported that principals were receiving positive feedback from their teachers. As supervisor of middle schools, he also saw indications that a focus on academic language was helping shape instructional practice in some middle school classrooms:

> We actually were seeing that this was making the changes we were looking for in certain classrooms.… I kept track of how many classes were in rows versus groups, and I saw an immediate change after the trainings began. Our middle school principals saw that change too, and they were seeing in their classrooms this rich dialogue take place.

Early success and increased reach

Several factors laid the foundation for the success of the ILC project in Madera. Members of the ILC team, well-known in the district, had earned excellent reputations for their outstanding professionalism. The team secured robust support from district and school administrators. The Madera ILC offered ongoing learning opportunities for teachers through workshops in which the team modeled the instructional practices teachers were supposed to learn. In addition to frequent interactions with the teachers at their respective schools, the ILC members kept in contact with teachers from other schools. Their presence and influence were systemwide.

Members of the ILC team, well-known in the district, had earned excellent reputations for their outstanding professionalism.

Teachers reported that with the emphasis on more authentic teacher-student and student-student interactions, and with a more engaging curriculum, students were developing more positive views of themselves and of their time in school. Todd described what he heard from teachers:

> Here's the thing that was a real tipping point for me.... [Teachers] heard kids say things like, "I felt smart today." That's a huge thing to hear a kid say. When a 7th-grader tells you, who's not doing well in school, they felt smart today, it's because someone taught them how to feel smart today.

However, despite the indication of increased engagement from teachers and students, the ILC team recognized several potential limitations. They had gained traction at the middle school level, but there was also need for uptake at the elementary and secondary levels if they were to see changes in student learning more broadly. They also pushed for increased rigor and depth in the instruction. They realized that deepening the classroom discourse was necessary to promote deeper learning consistent with the demands of the CCSS.

As Todd further described:

> If you're not asking the ambiguous question that a student has to wrestle with and has to prioritize their thoughts, you're missing the biggest opportunity of the entire environment you've created. The academic talk only leads itself to higher-order questions. If we don't add that piece in, we're going to see very minimal increases. We're going to see better engagement, but we're not going to see knowledge ownership.

To expand the teachers' repertoires, the ILC team added discussion and activities on higher-order questioning. ILC members saw this as a necessary move toward students effectively developing arguments from evidence, as Todd explained:

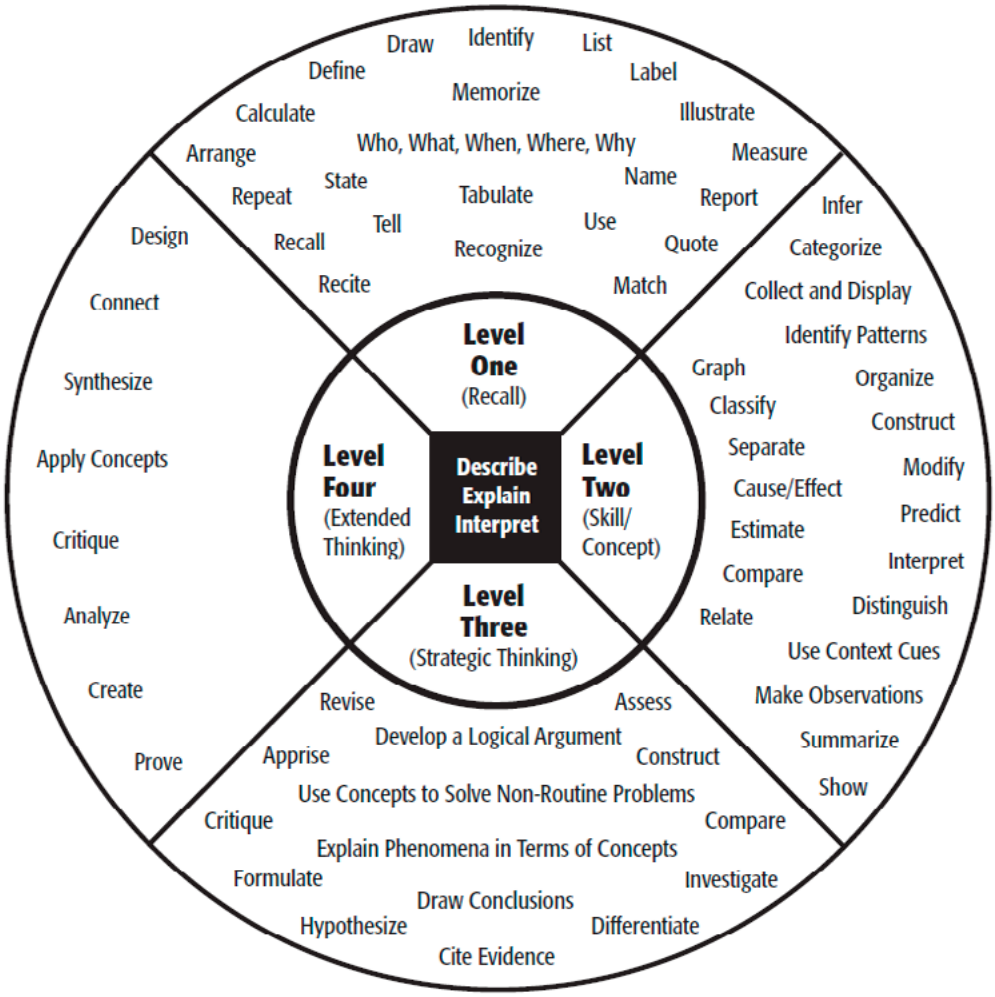
> We really felt like we wanted to take the success of academic talk and embed that in the whole district's repertoire moving forward. We felt like we could make a justifiable case that collaborative groups, academic talk, higher-order questioning, and arguing from evidence were four elements that all built upon one another.
>
> The next step, in our conception of it, was get them in collaborative groups, learn how to do that, get them to get into the academic talk. The teacher needs

to understand how to move this group now that [the task] is organized properly with higher-order questions, and now we need to work on the argumentation from evidence, and that's not just verbal. That's got to be written, too.

Depth of knowledge

A depth of knowledge (DoK) framework is a classification system for determining the cognitive complexity of a teaching task. It consists of four levels, ranging from tasks that prioritize memorization and recall (Level 1) and basic application of concepts (Level 2) to those that require strategic thinking (Level 3) or analysis, synthesis, and the application of knowledge to novel circumstances or problems (Level 4).[48] The DoK framework thus reflects and parallels the broader educational movement from assessments that prioritize memorization and basic skill application to assessments of deeper learning that reflect the CCSS and NGSS. (See Figure 6 and Figure 7 for DoK levels and sample questions for each level.)

Figure 6
Depth of Knowledge Levels



Source: Handout created by Dr. Norman Webb, University of Wisconsin–Madison, and used by teacher leaders from Madera ILC during professional development workshops in 2017–18.

Figure 7
Depth of Knowledge Question Stems

DoK 1

- Can you recall _____ ?
- When did _____ happen?
- Who was _____ ?
- How can you recognize _____ ?
- What is _____ ?
- How can you find the meaning of _____ ?
- Can you recall _____ ?
- Can you select _____ ?
- How would you write _____ ?
- What might you include on a list about _____ ?
- Who discovered _____ ?
- What is the formula for _____ ?
- Can you identify _____ ?
- How would you describe _____ ?

DoK 2

- Can you explain how _____ affected _____ ?
- How would you apply what you learned to develop _____ ?
- How would you compare _____ ? Contrast _____ ?
- How would you classify _____ ?
- How are _____ alike? Different?
- How would you classify the type of _____ ?
- What can you say about _____ ?
- How would you summarize _____ ?
- What steps are needed to edit _____ ?
- When would you use an outline to _____ ?
- How would you estimate _____ ?
- How could you organize _____ ?
- What would you use to classify _____ ?
- What do you notice about _____ ?

DoK 3

- How is _____ related to _____ ?
- What conclusions can you draw _____ ?
- How would you adapt _____ to create a different _____ ?
- How would you test _____ ?
- Can you predict the outcome if _____ ?
- What is the best answer? Why?
- What conclusion can be drawn from these three texts?
- What is your interpretation of this text? Support your rationale.
- How would you describe the sequence of _____ ?
- What facts would you select to support _____ ?
- Can you elaborate on the reason _____ ?
- What would happen if _____ ?
- Can you formulate a theory for _____ ?
- How would you test _____ ?

DoK 4

- Write a thesis, drawing conclusions from multiple sources.
- Design and conduct an experiment. Gather information to develop alternative explanations for the results of an experiment.
- Write a research paper on a topic.
- Apply information from one text to another text to develop a persuasive argument.
- What information can you gather to support your idea about _____ ?
- DoK 4 would most likely be the writing of a research paper or applying information from one text to another text to develop a persuasive argument.
- DoK 4 requires time for extended thinking.

Source: Adapted from a handout created by Dr. Norman Webb, University of Wisconsin–Madison, and used by teacher leaders from Madera ILC during professional development workshops in 2017–18.

In workshops we observed, the Madera ILC team distributed handouts to teachers that outlined the levels and encouraged them to use these tools to shape their lesson planning. The team explained that language was an important element of moving from lower- to higher-order questioning with the DoK framework. They shared examples of how shifts in in-class questioning could prompt students' thinking and move them toward extending the cognitive demand of learning tasks. Among the tools was the well-known DoK Wheel (Figure 6) as well as question stems (Figure 7) that teachers could use in class. However, presenters emphasized that moving toward more cognitively demanding tasks was about more than simply "changing the verbs." A prerequisite is the appropriate scaffolding for classroom activities.

The ILC members also realized that working together more consistently would strengthen their workshops and reach extended audiences. Concurrently, Jacob and Linda were appointed as an administrator and instructional coach, respectively, when the district's CAO joined the team. The changed roles helped refocus the group on how to expand the workshops from middle schools to elementary schools. They combined their efforts with those of Amanda Wade, who had continued to offer workshops on CCSS-aligned instructional shifts to elementary school teachers in her role as a reading specialist.

Attending the ILC Learning From the Field conference in 2015 was a particularly opportune occasion for the team. Three team members commented that the conference helped in two ways: providing exposure to ideas and strategies from teacher leaders around the state and giving them a dedicated time and space to develop a coordinated approach. As a district administrator noted:

> This would've never happened without the ILC, and it would've never happened without having that January meeting. We all got a little bit of time. In fact, it was team time. We had the opportunity to go to one other session, and we asked: "Would it be OK if we skip this last session? Because we think we're onto something." We all sat down, and we fleshed out the whole scheme that we [had] been working on for the last year.
>
> Had we not been meeting with team time and region time at the ILC, I don't know that we would've had these collaborative discussions with other districts. We talked a lot with them. It was just a lot of, for lack of a better term, a lot of cross-pollination of good ideas with good people.

Training the trainers

In Year 2 of the project, the group resolved to use a training-the-trainers model to scale up the success they had had at the middle school level. First, the approach involved working with elementary and high school principals to raise awareness of the workshops and their potential to shape instructional practice aligned with the CCSS and NGSS and to get buy-in from the schools. Second, the group established workshops for teacher leaders in each school to train them in how to lead the workshops in their own schools.

The group delivered their original PDW to principals and/or vice principals from every school in the district and provided them with materials, including copies of the sentence frames. A district administrator noted that there was good support for the workshops from many principals. Many of the elementary school principals were already aware of the ILC team's work, in part because of Amanda's efforts with elementary school teachers. However, several were initially skeptical. That the team achieved a full turnout of administrators was due in large part to one team member, who,

in his new role as a district administrator, had reluctantly made workshop attendance a district requirement. School administrators were encouraged to send two teachers from their schools to a training-the-trainers workshop the following month.

The ILC team delivered two workshops in 2016, one in March and one in May, and followed up with a presentation to principals at an administrators' professional learning community (PLC) meeting in June. The teachers, now trainers, delivered the same workshops at whole-staff meetings at each of their schools. By the end of the 2015–16 school year, the ILC team reported that its workshops had reached all 1,000 teachers in the district.

Both principals and teachers reported positive responses. A 4th-grade teacher explained why and how the workshops were particularly useful for her:

> I'd never had that support of how to properly use sentence frames, how to properly address second language. To me, it was such an eye-opener. I'm considered a veteran teacher since I've been teaching for 10 years.... [Learning] how to use those sentence frames properly, how to structure things properly, using the thinking maps, it was like, "Finally, somebody explained this all to me! I could've been using this for so long." It basically changed my whole outlook on how I am addressing my year.

She continued with a more detailed description of the changes in her practice:

> I used more drawings and more pictures in my lessons, not just in presenting material to my students, but having them draw the pictures, so it reduced that stigma of having to copy words that they didn't know the meanings of and could get that visualization and a more relaxed environment of "I can do this, I can learn this," and the pictures helped them.
>
> Then, writing the sentences, it made more of a connection to them. Eventually, they were able to come up with their own sentence frames and come up with their own words, then recognize what words they didn't know, look up those words, and increase their knowledge. That was a major shift for me.

Although the team was in the fortunate position of being able to make the workshops mandatory, the policy had risks. The team had had positive responses from teachers once they engaged with the project, but a district administrator acknowledged that there was a balance between taking the work to scale and meeting teachers' immediate needs. The administrator noted that, given the statewide teacher shortages, teachers might depart for other districts if the administration failed to meet teachers' professional learning needs.

> If you're a brand-new teacher and this is your first assignment, you probably need more help with classroom management and engagement than you need with interdisciplinary curriculum. We want to make sure that what we're offering teachers fits the needs they have, and it can't be one-size-fits-all even for the PLC.

Occasionally, the ILC team also had to negotiate for time and resources with other professional development initiatives promoted by the district. To change patterns of interactions among students and raise the level of student talk, the district sometimes turned to outside professional development initiatives, for example, the Kagan Publishing and Professional Development organization.[49] To

introduce specific teaching strategies called Kagan Structures, the organization offers a wide range of workshops and products that include cooperative learning, multiple intelligences, and differentiated instruction. "Our teachers are all getting Kagan-trained, so they are getting strategies for groupwork," said one ILC member. Another teacher reported that after many years of Explicit Direct Instruction (EDI), he started using Kagan Structures "to get the kids moving and going."

Going systemwide: English language development (ELD), academic language, and induction for new teachers

By the end of Year 2, the Madera ILC team, both directly and indirectly through its network of trainers, had reached almost every administrator and teacher in the district with PDWs on academic talk and higher-order questioning. However, high teacher turnover meant many new teachers in the district each year, which in turn meant that it was critical to make teacher-led professional learning a sustainable part of the culture in Madera USD.

By the end of Year 2, the Madera ILC team, both directly and indirectly through its network of trainers, had reached almost every administrator and teacher in the district with PDWs on academic talk and higher-order questioning.

The team took several key steps. To start, it aligned its ILC workshop plans with the district's, which included adding an ELD focus. Then it added two new team members, Berta and Todd, as mentioned previously.

The ILC team's academic talk workshops were well positioned to complement the district's ELD objectives. Given the large number of students who needed to develop more advanced disciplinary language and literacy skills and the district's goal to reclassify more students as Fluent English Proficient, Madera USD recognized that the district's ELD program needed to incorporate both Integrated ELD and Designated ELD in classrooms and schools. In Integrated ELD, the curriculum and pedagogy reflect both the state content standards and the state ELD standards. The focus on content with language support means that ELD strategies are taught throughout the day and across disciplines to support students at different English language proficiency levels so that they can participate actively in discussion about deep content. In Designated ELD, teachers address the California ELD standards as the focal standards and use content for examples and topics for discussions. In California, districts are required to offer Designated ELD to students who score low on the California English Language Development Test[50] and who need the additional language support.

Berta, a district English language coordinator, described the ILC team's focus on academic language as particularly relevant and helpful and as corresponding to the district's English language learning principles. These principles include giving students more speaking time, encouraging them to speak in complete sentences, and pushing them to a point of productive discomfort that accelerates their language learning.

To garner professional and financial support, the ILC team reached out to the Director of Teacher Support Services, who ran the Beginning Teacher Support and Assessment (BTSA) Program. BTSA supports and mentors new teachers both in Madera USD and in other districts throughout Madera County. Together, BTSA and the ILC team developed a plan to extend the PDWs to the county's many new and provisionally credentialed teachers.

A challenge they faced in this endeavor was incentivizing attendance. Many district teachers live 25 miles away in neighboring Fresno or Clovis. Without additional funds to pay teachers for the workshops, drawing attendance on weekends was difficult. Through the director's personal connections, the team developed the workshops into a credit-bearing continuing education course through a pilot program at the University of San Diego.[51] The team also partnered with the local union office, which provided funds for dinner, and chose a school site convenient for commuting teachers. As the director explained:

> We strategized the best way to put it together. They thought maybe a Saturday, and do it all in one day. I found that Saturdays are hard to get teachers to volunteer their time. A lot of them [have] young families and have got T-ball and soccer, and we couldn't pay them. We don't have that kind of budget, so we tried to figure out a way to incentivize it.
>
> I have a connection with a college in San Diego that allows us to do professional development and offer them [attendees] a unit at $75 a unit. We offered them a unit. We offered them a free dinner. We did it over a course of two nights. In a way, that helps them. They are on their way home to Fresno anyway. This facility is on their way home. It seemed to all kind of mesh together in piloting it.

A Sample Course Description: "Academic Talks as a Foundation for Arguing From Evidence"

FOR MADERA UNIFIED SCHOOL DISTRICT TEACHERS ONLY

Come learn how to get your students talking: how to ask the sorts of questions that will give them interesting and higher order questions to talk about, and how to turn that talk into argument from evidence.

This is a lecture-practicum course. There will be 5 hours of classroom based learning, receiving information and practicing techniques for academic talk, higher order questions and questioning strategies and arguing for evidence. Each participant is expected to complete 5 hours of practicum, delivering lessons to students involving these strategies. An additional 5 hours are allotted for the development of lesson plans and the collection and analysis of student work.

Learner Outcomes

- Understanding of what Academic Talk, Higher Order Questions and Arguing from Evidence program is and its foundational instructional strategies pertinent to Madera USD
- Ability to design and deliver lessons incorporating these strategies
- Development of techniques for collecting and analyzing student work
- Reflection on the teaching and learning of these techniques

Course Details

- Number of Units: 1.0 units of graduate level extension credit in semester hours
- Course Classroom Dates: Thursday, March 16, 2017 and Tuesday, April 18, 2017
- Course Classroom Hours: 4:30–7:00 PM

Source: University of San Diego. (n.d.). Professional and continuing education course description EDC X726N. https://pce.sandiego.edu/search/publicCourseSearchDetails.do?method=load&courseId=43232730 (accessed 02/28/19).

Teacher-Led Professional Learning Takes Root in Madera

Over the course of 3 years, the professional learning workshop Academic Talk as a Foundation for Arguing From Evidence has spread widely among Madera USD educators. In Years 1 and 2, the ILC's goals were to spread learning of the CCSS and NGSS among teachers. In Year 3, the team emphasized that the ILC's work should "take root," meaning that the breadth of the workshops' reach should be balanced with achieving greater depth and focusing on building capacity with a view to longer-term sustainability.[52] In this section, we look at the extent to which the Madera ILC team was able to develop and take its workshops to scale, impact teaching and learning in the district, and develop productive partnerships that may in the future lead to sustainability of teacher-led professional learning.

Taking academic talk to scale

The Madera ILC team employed several key elements to achieve its wide reach of 1,000 teachers. Member credibility and professional legitimacy were important in the early stages of the project. This included not only ILC members' reputations as knowledgeable and experienced teachers, but also their acknowledged commitment to shifting teaching and learning in the district toward the new standards. Their previous involvement in other initiatives, such as the CCSS Steering Committee, contributed to their very positive welcome by other teachers.

During interviews, ILC members and teachers frequently returned to the themes of trust and confidence in their colleagues. ILC members felt that teachers who participated in the PDWs understood that the ILC members were motivated by more than district dictum and were genuinely dedicated to improving teaching to support student learning. As Jacob commented:

> That is probably why we've been successful. Because we've built that trust.... We weren't doing it to fulfill an ILC thing—that was secondary for us.... [We wanted] to do this for the kids and ... for our teachers. And if it fulfills the ILC, that's great. But we still put the focus on [whether] it's for our students and it's for our teachers.

Attracting support from middle school principals was another early step. Beyond passive support for teacher-led professional development, the administrators were willing to commit resources to support the workshops. For example, principals at the middle schools covered the costs of making posters of the sentence frames for every classroom, as well as additional resources for teachers and students. Jacob continued:

> Our principals trusted what we were doing. So when I said, "I need to make 1,000 copies of this and I want it on card stock," there was no question. They bought the paper. We had sentence frames for every student on yellow card stock and we had white card stock for every teacher.

Linda added, "They made posters of the sentence frames. Every kid in the school got a set of the principles for their binder. Teachers all got them in pocket protectors."

The middle school principals were also willing to commit hours of professional development time for the staff. At one school, this included 2 hours of an "institute day"—a day on which teachers learn new curricula and pedagogical strategies—as well as additional staff time on "early out" days. Principals were willing to spend money on substitute teachers to free up ILC members to observe and give feedback to other teachers in the school as they implemented what they had learned in the

workshops. Following the lead of the middle schools, some elementary schools also began to devote time for staff development during shortened days, and every second week teachers from different schools met to collaborate.

Securing district support was key to pushing the workshops more broadly. The district has changed the way it defines and evaluates quality teaching. Administrators routinely evaluate their staff's teaching, and Teachers on Special Assignment (ToSAs) enter classrooms to observe and provide feedback to teachers in support of their shifting practices. The people in these roles became interested in student engagement and how students developed and used language to learn. Teachers with whom we spoke indicated that classroom visits from administrators or ToSAs had previously felt focused on fidelity to the EDI instructional routine and keeping track with pacing guides. Now, it was more about student learning and engagement.

Research finds that when principals promote and participate in teacher learning and development, they endorse a leadership dimension with the strongest impact on student learning.[53] Thus, district support is crucial in bringing administrators together to support a training-the-trainers model. Although some principals in Madera USD initially felt compelled by the district to attend, ILC members said that principals were won over by teachers' positive feedback about the academic language workshops and were happy to participate. Administrators also participated in workshops at district meetings, which allowed them to experience teacher learning firsthand.

Having district representatives on the ILC team further facilitated engagement with the district. Two ILC members—perhaps as a result of their success as teachers and teacher leaders—took up instructional coaching roles within the district, and another senior district administrator also joined the team. Beyond compelling attendance from administrators at workshops, the team was also able to align its ILC work with district priorities, a critical factor in taking the instructional shifts to scale. ILC members were able to encourage teachers to make significant changes in their teaching—including ditching previous pacing guides—with the blessing of the district, sending a message that this was not the work of a few "rogue" teachers but rather the kind of change progressively sought by the district. Individual teachers learned, and the district became a learning organization as well.

The increased uptake of CCSS by Madera teachers is consistent with evidence from the district. Madera's Local Control Accountability Plan data show that when teachers were asked whether their professional development had prepared them for shifts to CCSS, the proportion who agreed or strongly agreed increased from just 29% in 2014–15 to 50% in 2016–17.[54]

Shifts in teaching and learning

A core ILC tenet is that high-quality professional learning be embedded in its work. Professional learning is effective when it is not a "one-shot" deal, but rather when it provides opportunities for teachers to learn new strategies, try them out in the classroom, have additional sessions to follow up, and collaboratively plan to improve practice.[55] During the early adoption of CCSS in Madera USD, one

Professional learning is effective when it is not a "one-shot" deal, but rather when it provides opportunities for teachers to learn new strategies, try them out in the classroom, have additional sessions to follow up, and collaboratively plan to improve practice.

ILC member began working with colleagues to jointly plan lessons that went beyond the texts. They asked themselves what skills they wanted students to have and then "backwards-mapped" to create lessons that would help students build those skills, as Jacob described:

> For example, I'm going to say, "systems of equations." You know, in the old way you just taught, "Draw the line where they cross and that is your solution," and move on. We started looking at it, saying kids actually have to recognize what that meeting point is. They need to recognize how to graph. They need all these pieces. What is it in the real world that actually explores that? And what most people use anyway are cell phone prices. We went a little beyond it. We said, "Well, we want them to find the prices, we don't want to just give it to them. So, we're gonna bring them into the computer lab and we're gonna have them look up AT&T, Verizon, all that stuff, and they need to bring in the data. And they need to figure out what is the starting point." And that's really what we said: "What are activities that we can do where it's not just us telling them what the knowledge is, but they are bringing it to themselves and making sense of it?"

Teachers and ILC members alike described increased student engagement as a main effect of changing patterns of interaction in the classroom. One teacher noted that by using structures such as sentence frames in her 5th-grade classroom and giving more class time over to her students to talk, they became more actively involved in the lessons. She explained, "I see changes in the students, and they seem a lot more engaged. And engagement is everything. If you don't have students who are engaged, it's hard for them to learn, because they're not with you."

Another teacher, a 12-year veteran but new to teaching ELs, noted how using the sentence frames helped her students develop and begin to transfer their language skills:

> I could see that once they got used to using the sentence frames and completing them, they were able to answer and restate questions, for example, by putting the question inside the answer. They were able to do that on their own eventually because they saw how sentence frames helped with that.
>
> Then, also what I was seeing is they would bring it over not only from reading and writing, but … into social studies, into science, and into math. They were just naturally doing it.

In his role as an administrator, Jacob described how teachers, when they have the flexibility to be more creative in lesson planning, contribute to changes in instructional practice, including using more engaging content and developing vocabulary in context:

> I have teachers who don't show PowerPoint ever, and I love it because they come in and they have a tangible object that they just put out on the table and just tell the kids, "What math is involved in this?" If you tell the kids, "The volume unit is coming up, … this is the formula for volume of a sphere—memorize it. Now here's some worksheets," they don't care. But if you just come in with a soccer ball, our kids love soccer, and you say, "What can you tell me about this?" "Well, … it's made of this material." "What's it filled with?" "It's filled with air." "Do you know what that's called? Well, that's volume. Volume is what fills up the soccer ball."

> Now the kids are engaged and they're excited and they're noisy because they're talking about soccer. The old way was, "I'm going to tell you exactly what the formula is.… Here's a picture of a ball." No, let's actually bring in the ball and let the kids hold it. Let them realize why surface area is there.

Another ILC member described the positive feedback from teachers regarding the workshops and how they urged the ILC members to seek continued support from the administrators:

> It was positive, and we heard things like, "Oh, the kids think they sound so smart now that they have a way to frame their conversations." Really very positive. And they asked, "Please … have the principals make this the priority because if it isn't a priority for principals, it won't happen. It won't continue to be a priority to the classroom." What doesn't get monitored doesn't get paid attention to. And that was from the teachers, not from the principals.

The academic language workshops were a kind of catalyst, one of many factors potentially resulting in fundamental change in teaching practice. As with other ILC workshops, only two sessions were offered, with sporadic follow-up in classrooms, ongoing collaboration, feedback on practice, and reflection. Although time was set aside for collaborative lesson planning, it was a scarce commodity, frequently truncated by administrative announcements and information.

ILC members acknowledged that there were limitations in their ability to follow up with teachers in part because of lack of time and in part because there were too many teachers and too few ILC members to support them. ILC members occasionally used technology to facilitate communication and feedback. Linda noted that some teachers would "send me lesson plans and ask, 'How can we embed a sentence frame here? What would be appropriate for higher-order questions?' A lot more online communication happens."

Follow-up appeared to be more challenging in schools whose teachers participated in the training-the-trainers program. Teachers we spoke with at one school acknowledged the usefulness of the workshops and had incorporated the strategies into their teaching practice. They also described having a second meeting in which teachers could discuss their experiences in trying out the tools they had learned and get feedback from their colleagues. However, they noted that, until recently, there were no structures in place for teachers to observe a colleague's class, provide feedback, or problem-solve together.

One teacher felt that this was in part an issue of cost, but also an issue of trust. Teachers described feeling criticized and at times threatened by the classroom observations under the previous EDI-based strategy, which they perceived as focused solely on keeping step with pacing guides and not on effectively supporting teacher learning, as this teacher explained:

> I think people are not very open to [classroom observations].… We've lived through many years where people came into the classroom to kind of just put the thumb down on you and tell you what you're supposed to be doing or not doing. So, people are legitimately kind of afraid, when I think if you make it safe, we just want to learn.…
>
> That was during the EDI time. I had to be on the same page and have the students repeat the same thing, write the same thing, and everybody [had] to be … at the grade level. We didn't experience that here at this school; we didn't have an administrator

> who was like that. But at other schools in the district, there [were] a couple [of administrators] that were, like, you had to be on page 10 of the story. One teacher [could not] be teaching something differently, or else they would get in trouble.

Nonetheless, there was evidence that teachers were now free to deviate from pacing guides and turn over more speaking time to their students. This newfound freedom gave them increased confidence in their abilities as teachers. Jacob noted:

> Teachers are much more willing to try things that they were fearful of before. I think there's a confidence level, which I think is what they needed. I do not think that anything we're presenting on is foreign. I think everybody sees it as good teaching, a good practice, but it's been that confidence to actually do it.

He went on to describe how teachers also felt greater confidence in their existing knowledge and felt less constrained to be purposeful in shaping their instructional practice. This led to a significant change in teachers' stance toward their work:

> None of it is things that teachers haven't been doing. I just don't think they were allowed to just make it happen. I think that's really the big shift. They're finally being allowed to do what they've always known was right. But now they have tools to actually do it and the trust for it to be OK if it doesn't go perfectly the first time. Which is what we want our kids to learn, also.

Thus, the academic talk workshops contributed to a change in the discourse of teaching and learning in the district. ILC members reported that it was not just early-career teachers who were taking on the learning, but also experienced teachers who felt liberated and capable to use their experience to make decisions about curricula. Linda characterized it as follows:

> When people came back to us and talked about how that training went, they said, "Oh, teachers felt like they were being validated for the good work they did, if they already were using them [the strategies]." They felt validated, the teachers who were using these techniques or had been to Kate Kinsella training or were working on these EL strategies.... And then the teachers who hadn't felt like that now had something to start with.

From the classrooms

Persuasive evidence about the success of teacher professional learning can be gathered by observing classrooms. In our observations in Madera USD, we visited the classrooms of three teachers who had participated in ILC workshops: a 1st-grade, 3rd-grade, and 5th-grade classroom.

The 1st-grade classroom

At an elementary school in southwestern Madera, we visited a 1st-grade classroom led by a teacher who is also an ILC member. The school's demographics were reflective of those of Madera USD as a whole, with approximately 90% of students eligible for free or reduced-price meals and nearly 30% classified as ELs.

Students began the day sitting on the multicolor mat surrounded by tables where they usually work in groups of four to six. After a short "dance routine" in which the students and teacher moved their bodies for about 2 minutes, the teacher prompted the students with a couple of warm-up questions and asked them to answer with the following sentence frame: "I like (mmmm) because (mmmm)." After the teacher modeled one exchange with a student, the students stood up and paired up and shared their responses. For example, in response to the teacher's question about what things they like to do in the morning and at night, the students raised their hands and responded in full sentences: "I like daytime because I can ride my bike outside." Or "I like nighttime, because I get to wrestle with my dad."

After about 5 minutes, the teacher called the class to gather again on the mat. She reminded the students of the essential question for the day's lesson, "Why do people trade with each other?" With the support of a few PowerPoint slides, she reviewed the concepts of "goods" and "services," using milk and milk delivery as an example. As she advanced the slides, students were asked to classify the icons grouped in two columns: goods (e.g., clothes, a PlayStation, and food) and services (e.g., a grocer, a power plant, an airplane, and a truck). Although she had asked the students to explain their reasoning, the teacher on several occasions provided the reasoning for them. Occasionally, the distinction between goods and services was murky. For example, although the image of an airplane was shown in the column for services because of its role in transportation, it could also be categorized as a good. The teacher chose not to delve into this potential ambiguity.

Keeping a relatively fast pace, the teacher and students returned to another pair-share activity using the structure, "I would rather … because…," followed by a share-out to the group. The teacher then had to leave the classroom to prepare for a workshop, and a substitute teacher took over the class.

This lesson demonstrates the explicit use of sentence frames that are designed to link students' opinions and reasoning, a structure similar to those distributed to teachers in the ILC professional development workshops. The teacher made connections to students' everyday experiences. Students reviewed definitions and classified goods and services using reasoning and evidence. As students moved from one participant structure to another (collaborative conversations, 2-minute interactive lecture, fast-paced and short teacher-student exchanges), the teacher created a language-rich environment with multiple opportunities to develop students' oral proficiency.

The 3rd-grade classroom

The 3rd-grade classroom we observed was at an elementary school in northeast Madera. The veteran teacher had participated in an academic talk workshop and was subsequently invited to attend the training-the-trainers workshop to share with her colleagues what she had learned.

At this school, approximately 95% of students were eligible for free or reduced-price meals and nearly half the students were classified as ELs. The teacher noted that getting students to have collaborative conversations was one of her major objectives.

The 17 girls and 10 boys sat in groups of five or six around five table clusters, fairly evenly distributed by gender. The teacher led much of the class from a desk at the front, with a computer projecting slides onto a whiteboard. Adjacent to the whiteboard were posters showing some of the sentence frames introduced during the academic language workshops: "I agree with you, because…" and "What I hear you saying is…."

The slide on the board reminded students of discussion guidelines: "Remember [you are] only sharing if you make a: text-to-self connection, text-to-text connection, or text-to-world connection." At first, the teacher had planned to have students talk about sharks in California based on an earlier video. Instead, she decided to begin with a warm-up activity, asking, "What is your favorite game?" Pairs of students took turns asking and answering the question. The teacher then transitioned to a group activity called "speed ball," in which students in small groups pass around a mini beach ball with key prompts written on it, such as "elaborate," "explain," and "reason why." Checking first for understanding of the prompts, the teacher asked for an example of when students are asked to "explain," and the students replied in unison, "in math." The activity began with the question, "What is your favorite food?" As the ball was passed among the group, each student added on to the comment made previously by their peer by using the prompt that faced them upon receiving the ball.

Realizing that the groups had completed their conversations, the teacher called on several students to provide examples from the activity. The teacher often urged students to "use complete sentences," a reminder consistent with the district's ELD principles. The teacher then moved the class to paired conversation work using a variation of "musical chairs" to answer the next question on the slide: "What's something you're really good at?" When the music played, the students could move freely about the room; when it stopped, they paused and talked in pairs, sometimes using the prompts from the previous game. The students had ample time for several rounds to respond to this question and clearly enjoyed describing and explaining what they were good at.

For the next part of the lesson, the students returned to their desks and pulled out their textbooks. The whiteboard briefly displayed the lesson's essential question, "How do animals adapt to challenges in their habitat?" Students followed along as a text about animals in the Mojave Desert was displayed on the board and read aloud by a computer voice. After the first passage, the teacher read the prompts shown on the next slide: "They are similar because…" and "They are different because…." After the second passage, students' engagement appeared to be flagging, with several students looking away from their books and quietly gazing around the room. The teacher asked questions regarding the meaning of key vocabulary (e.g., "vibrations") from the passages. After the third passage, the teacher distributed a "Compare and Contrast" worksheet for the subsequent lesson. The lesson ended as students wrote their names on the worksheet.

For most of this lesson, students had the opportunity to use oral language actively and consistently. Talking to one another, using sentence frames, responding to the teacher when offering examples, or answering her questions were routine activities in this classroom. Although at first the questions were relatively simple, the students had opportunities to raise the level of conversation by elaborating, explaining, and justifying their choices. Student engagement was high because the activities were structured such that each student had to add to the conversation when in groups or engage with a partner when in pairs. Student engagement decreased during reading time as the students were getting ready for recess. For this lesson, the teacher's main objective was to engage her students in collaborative conversations, and she achieved that objective.

The 5th-grade classroom

We met a 5th-grade teacher at the two PDWs we attended in Madera USD. He had entered teaching after spending some years in business, had received his credential at a local university, and was working on his master's degree. Then in his second year of teaching, he was considered a beginning teacher and benefited from the support of a BTSA mentor.

The teacher liked the ILC workshops he attended and was ready to participate in any future ones. He commented:

> They were much better in meeting my needs than, say, a PLC meeting or somewhere where we were just kind of talking about things. It went a lot deeper than just a high-level overview, and that is what I really liked about it.

He was particularly concerned about how to get students to become more engaged and to talk "academically."

> We can talk about using proper structure or key words or something like that, but we really went more in depth.… How to engage them in that conversation, not just feeding them a word to use in a sentence frame. So that's what I mean by deeper, more maybe the theory behind it or the understanding behind it.

Upon entering his classroom, we saw 32 5th-graders, sitting in groups of four, working individually on their computers. For about 15 minutes, they reviewed what they had learned about fractions in the past few lessons. As students started to raise their eyes from the screens, the teacher called for attention. He introduced us to the class as visitors here to observe how they learn and talk together. He proceeded to introduce the day's lesson and supported his short lecture with a few PowerPoint slides: "We are focusing on academic language today, and we want to practice sentence structures." He alerted the students that he would be walking around the groups to listen specifically for their use of sentence frames that showed how to agree or disagree and how to ask for clarification.

The day's task asked the students to figure out how many yards of cloth Thelma had left if she used two thirds of the 8-yard cloth she had. Once they figured it out, the groups were to prepare posters showing how they found the answer and present it to the class. As soon as the teacher read the problem, a student suggested to his group, "Well, two thirds is more than half, so it's more than 4 yards." Sadly, none of his peers nor the teacher heard his comment.

After reading the instructions on the cards on their tables, the students proceeded to tackle the problem. They seemed quite comfortable with this routine and immediately started talking animatedly, asking questions, offering ideas, and listening actively. In some groups, one or two students started writing and noting their calculations. Four of the eight groups quickly—and erroneously—decided that the answer was $8 - 2/3 = x$. Once they started preparing their posters and trying to justify their answers, they realized they needed to review and revise their work.

As the teacher walked around the classroom, closely observing the groups, he kept asking questions. He deliberately refrained from calling students' attention to obvious mistakes or correcting them. Some of his questions related to the mathematics of the task and some to the language the students were using. He often repeated students' words when he heard them agreeing or disagreeing or asking for clarification.

Student engagement was high. Most students were intently talking to one another, explaining their proposed equations or explaining to one another how to add and subtract fractions. Less than a quarter of the students were just listening to the conversations, taking notes or drawing the poster. Only a small fraction of students were clearly disengaged. After about 25 minutes, the teacher reminded the students to start preparing the posters. Because only some students in the group were actually drawing or coloring the posters, the level of disengagement grew.

In a post-observation interview, we asked the teacher about how he designed the learning task:

> I saw a math talk conversation, and I just kind of pieced things together. I talked with our curriculum and instruction coach here and said, "This is what I'm planning on doing and what do you think?" She said, "Go with it, it's great." So, I just gave it a shot. I've done some math talks before in the class, but I didn't go to the detail that I did on that one day.

Reflecting on his lesson, he mentioned that it was mainly during the presentations that he called the students' attention to the sentence frames. In response to a question about whether he focused the students on using academic language during the presentations, he said:

> I was able to a little bit. Using those sentence frames, I redirected [the presentations] a couple of times.... Once the groups presented, the others were able to ask a clarifying question and usually [they said] "I agree" and "I disagree." It seemed to help to keep the dialogue going. The kids really enjoy doing it.

In this lesson, the teacher thoughtfully set the stage for students to work in groups on a word problem and supported them in their understanding of the mathematics and in their use of formal academic language structures. Groupwork increased opportunities for interaction and, thus, active use of language. By assigning a word problem rather than a simpler item prompting a mathematical operation, he raised the complexity of the task and further set the stage for increased interactions. Finally, by pointing the students' attention to the language to use, he demonstrated the importance of using academic language. This teacher and his colleagues whom we observed had clearly incorporated the development of academic language into their teaching repertoires.

Strengthening teacher leadership

ILC members' involvement in creating and leading professional learning in the district benefited the ILC members themselves. For example, one member explained that working with colleagues helped energize ILC members' own work as mentors, particularly because they felt they were having an impact in shaping teachers' practice, noting, "I'm excited to do PD [professional development] now because teachers, they come back. They want to come do some more. I see the same people in all the PD I do, once I get them going." Another commented:

> Having been part of creating the professional development with my team has pushed me to want to become better and helped me to notice the need, because there's a huge teacher learning need. Professional development is never-ending.... There's always the need to develop as a professional.

ILC members also indicated that a benefit of the ILC work was that it gave value to their own knowledge and experience. One described how she realized that the ability to develop and share professional learning was not solely the domain of university scholars. "It wasn't magic sauce owned by people who get paid a lot more money than I do. So, the ILC was instrumental in that kind of confidence."

Jacob described how helping teachers gain confidence and see the potential in all their students had helped re-instill a sense of professional responsibility for student learning and well-being that extended beyond a teacher's individual classroom:

> The ILC, for me, has been about how we can carry not the same exact ideas but that same passion and belief that we can do better. When you get caught up in how my school is doing or how my district is doing, we forget that it's a larger stage. That we are not just here for this small group. We have to impact as many as possible if we are true educators.

He went on to note that involvement with the program did more than allow ILC members to support other teachers' individual practice; it also helped them understand how teachers could work together as a professional community to move student learning forward:

> When you're in isolation and you're just doing stuff in your classroom, you don't know if it's good. You don't know if you're actually having an impact. But when you can share it with other teachers and get their ideas, it becomes not my idea, but our idea. And if I'm struggling, I have someone who can support me on it.

Productive partnerships for sustainability

The work of the ILC team in Madera over the past 3 years in spreading the academic talk workshops has changed relationships among institutions and individuals in the district, which in turn suggests that the work of shifting instructional practice might be sustainable. Important among these changes are the interactions among the district, administrators, Teachers on Special Assignment (ToSAs), and teachers in the classroom.

Support provided by ToSAs was key to sustaining changes in instructional practice. Their role in Madera is one of instructional coaching. Teachers we spoke with noted how, under the previous EDI-based strategy, ToSAs monitored whether teachers were implementing the EDI instructional model with fidelity and moving through the curriculum in step with pacing guides. The focus was on the teachers' actions, and considerably less attention was given to student activities or how students used language as evidence of learning. Rarely were there suggestions for modifying strategies to benefit student engagement.

Yet there may be a shift in how ToSAs view their role. A senior district administrator noted:

> Some Teachers on Special Assignment in the middle schools … saw the immediate benefit of [the workshops] and got to watch it unfold and see the change in classrooms, and they were very supportive, and they've been very supportive ever since. One of the reasons why for me that's such a key is because they're the people who will be there to spur this along. In the absence of the ILC, how does this sustain itself where somebody has a coaching role and a responsibility to encourage even further development?

During visits to Madera, we also observed a former ToSA attending the workshop targeted at new inductees because she saw the academic talk training as valuable to the changes she wanted to make in her own teaching. Ideally, in the future, newly appointed ToSAs will be able to play an important role in sustaining the district's changes in teaching practices.

Participating teachers in the workshop noted that there was still pressure from some administrators to move through the curriculum, even though they felt that in doing so some students were being left behind. Aided by present and former ToSAs as ILC members, the ILC team sought to assure inductees that there was support from the district for deviating from the EDI model, with recent changes being made to the evaluation criteria for walk-throughs. Yet one member also acknowledged that although in his present role as an administrator he did not want to see pacing guides from teachers, only a minority of his colleagues to date had made that same shift:

> I want to know if the kids are learning. Here's your target [*raises hand upward*]—you're the professional, figure out how to get there. There's probably about 10% of administrators who are on that right now, but it's shifting, especially because we have a new wave of district office personnel who are more in tune with the expectations and what the data say. The hardest part, especially if you're a newer teacher, is getting some of the veteran teachers to latch on. But it's coming, and I would highly recommend having that conversation with your administrator and say, "I want to do this, and this is why."

Given that pacing guides had been dominant in the district for 9 years, many experienced teachers (who may serve as ToSAs) and administrators had spent most of their careers with EDI as a blueprint for what quality teaching looks like. This may explain lingering tension in the relationship between some elementary administrators and teachers with regard to instruction.

ILC team members had also sought to actively build relationships with the district to help shift the culture of teaching. This included participating in board meetings to explain their work and how it could align with district initiatives to support teaching quality. As one team member described:

> We also went to our school board two different times and spoke in that … public comment section, and thanked them for supporting our connection with the Instructional Leadership Corps. We talked about what we were doing, trying to present this teacher-driven change as a positive rather than scary. So, we need to try to build those alliances and talk about how we could help district initiatives move forward.

In June 2016, ILC members Amanda (the local union Vice President) and Todd (the District Chief Academic Officer at the time) jointly presented at the ILC San Jose regional conference. Their presentation, called "Growing Collaborative Relationships," focused on leadership in Madera, referencing a 2013 Roland Barth article that described a "union vs. management" stance toward responsibility as one of five key obstacles to effectively leveraging teacher leadership.[56] The pair noted collaborative union–district efforts with the Common Core Steering Committee and how district academic initiatives had been shaped by the work of the ILC.

Given that the relations between district and union have not always been smooth, with significant labor tensions in 2012 and 2013 around contract renegotiations,[57] this rapprochement was a particularly promising development. The ILC had provided an additional forum for cooperation

between the two, as evidenced by the district's willingness to pilot the academic talk workshops as part of all new teachers' induction. The backing of the union was steady—from recruiting and supporting the members to funding dinner for teachers who attended the workshops. Such cooperation improves the prospect for the program to become an ongoing part of teacher professional learning in the district. It also sends a consistent message to the teachers from the district and from the union.

ILC participation has encouraged team members to expand their networks of support to other organizations and individuals involved in similar efforts. Linda noted:

> So, I can call the head of the California Science Project and talk to her about a science project and what can we bring to Madera, and I'm confident and comfortable doing that. I don't know if I would have been comfortable talking to the leaders of these organizations in that way if I hadn't done ILC work.

This sentiment was echoed by Jacob:

> ILC has been the biggest impact for me. It is just having that network where maybe something isn't going well for someone to remind you that we're going in the right direction. And if we're not, how do we shift that? How do we become stronger together?

The ILC team also served as a resource for other organizations. The Madera ILC team was twice invited to present its workshop at the annual FACET (Fresno Area Council of English Teachers) and CATE (California Association of Teachers of English) Yosemite Conference, which brings together teachers from neighboring Fresno and Tulare counties and others in the San Joaquin Valley.

Teacher Learning Continued

About a year after our last site visit, Linda described to us some of the ILC members' recent activities in her district. She was excited about an 8-week class on literacy topics and literacy skills that all new teachers in grades k–2 are "assigned to attend as part of their induction into the district." Amanda, one of the founding members of the Madera ILC team, and two newer members organized the workshops. The class, supported and paid for by the district, is an offshoot of the ILC team's previous efforts to support the induction program. A particularly productive aspect of the class was the recording and analyzing of videos of teacher leaders presenting the new skills.

Following the "teachers teaching teachers" model, the work of the ILC continues at sites districtwide. For example, the teachers conduct the sessions on professional development days at the school at which Jacob, an ILC leader, is the Vice Principal. Berta, an ILC leader and district English Language Coordinator (Secondary), and members of her ELD team conduct workshops "the ILC way" at different school sites. Linda and the district's elementary coaching team, working in parallel at three different sites, were able to reach all the elementary school teachers with the recursive PDWs introduced by the ILC. Linda said that recognizing the "wealth of teachers with a wealth of knowledge in the district," the ILC team is seeking to invite a group of teachers and provide them information about adult learning as well as how to lead PDWs. These teachers can then be ready to teach their colleagues a productive teaching technique that "they want to share or show off." The ILC leaders are looking forward to empowering more teachers in the district to share their knowledge and skills with their colleagues in systematic ways.

With sustained support from the district administration, Linda is confident that Madera USD "will continue forward with teacher-led professional development."

Key Takeaways

Since its inception, the ILC team in Madera USD has reached nearly all teachers in the district through its workshops or the training-the-trainers approach. Teachers are reporting that the desired shifts in how students learn and teachers teach are beginning to be realized. Our classroom observations found evidence that teachers are using the strategies and that students are engaging in collaborative conversations and actively interacting with peers and the teacher.

ILC teacher leaders' solid reputations as knowledgeable professionals reinforced their colleagues' confidence and trust. They continue to be perceived as legitimate and effective teachers of teachers who are aware of the particular needs of students and teachers in their district. The team is robust, and its members share a commitment to make wide-reaching and deep changes that benefit students' and teachers' learning.

The ILC team expanded its reach by connecting with school and district leaders and building professional networks. For example, the team partnered with the BTSA program to address the learning needs of novice teachers. Furthermore, the team has fostered professional and personal relationships within and across schools and built networks of educators who collaborate consistently for the benefit of the students.

The ILC experience demonstrates that regular instructional coaching is important for consistent instructional changes to occur. Dependable follow-up and specific feedback based on systematic classroom observations are key to deepening and sustaining instructional changes. With continued guidance and support, the ILC team is likely to be able to reach farther and go even deeper.

Chapter III: The Instructional Leadership Corps in the East Side Alliance: Focusing on Learning and Teaching of Mathematics

The California Common Core State Standards in Mathematics (CA CCSSM) calls for students to learn mathematical content in the context of real-world situations; develop mathematical understanding; and engage in practices that prepare them for college, career, and productive citizenship. The implementation of the standards raises the bar for what is expected of teachers and students in the classroom, as well as for administrators at the schools and in district offices. To secure the successful enactment of complex mathematical content and mathematical practice, extensive and ongoing professional learning is indispensable.

In this chapter, we profile two teams of ILC teacher leaders from the East Side Alliance, a collective consisting of a high school district and its seven k–8 feeder districts in the San Jose, CA, area. The locally oriented and targeted work of these two teams in the unique context of a multidistrict, geographically dispersed, and diverse region is particularly enlightening.

The California Common Core State Standards in Mathematics (CA CCSSM)

The CA CCSSM includes two kinds of standards: mathematical practice standards that are identical for all grade levels and mathematical content standards that are different for each grade level. Focus, rigor, and coherence are central concepts inherent in the standards. The emphasis on coherence, in particular, makes k–12 vertical alignment increasingly important. Coherence arises when mathematical connections are clarified either at a single grade level, or vertically across grade levels, to support the progression of knowledge and the continuous development of skills. Thus, an emphasis on k–12 vertical alignment has become increasingly important within and across districts and in schools. The East Side Alliance is a case in point.

The Standards for Mathematical Practice specify how students will engage with their teachers, their peers, and the mathematics. These standards include reasoning and explaining, modeling and using tools, and recognizing structure and generalizing. To support students in developing these practices and habits of mind, it is important for teachers to have both deep content knowledge and deep pedagogical content knowledge. The implementation of the CA CCSSM places significant demands on teachers' work in the classroom and thus challenges them to seek out professional learning that parallels students' learning.

Professional learning opportunities and high-quality teacher performance are particularly important so that teachers can successfully serve students from poorly resourced communities who may arrive at school underprepared or still in the process of acquiring the language of instruction. In particular, because mathematics as a school subject has traditionally been a gatekeeper to successful career and college preparation and a blunt instrument for intra- and inter-school tracking, which can lead to racial, ethnic, and linguistic segregation,[58] teachers are yearning for more preparation for the successful implementation of the CA CCSSM.

Implementing the CA CCSSM takes considerable time, effort, and financial and human resources, including sustained professional learning and reliable follow-up in the classroom. Learning in the company of colleagues has shown much promise in the field.[59] Many teachers seek to learn with

and from each other. The districts of the East Side Alliance aim to provide professional learning opportunities for teachers that includes that component. Two ILC teams developed their projects in the districts of the East Side Alliance.

About the East Side Alliance

The East Side Alliance (ESA) in East San Jose is a formal partnership between East Side Union High School District (ESUHSD) and its seven k–8 feeder districts: Alum Rock, Berryessa, Evergreen, Franklin-McKinley, Mount Pleasant, Oak Grove, and Orchard. The ESA serves around 85,000 students in ESUHSD's 29 traditional, alternative, charter, and adult education schools as well as students in dozens of elementary and middle schools in the feeder districts. Partner organizations include the Silicon Valley Education Foundation and other philanthropic organizations, corporations, and two higher education institutions, San Jose State University and Evergreen Community College.

As a regional educational community, the ESA aims to improve student learning outcomes and address high school preparedness as well as college and career readiness. The partner districts are independent agencies that have agreed to collaborate toward a common purpose with agreed-upon common goals. First among the proclaimed goals of the ESA is to increase the number of students who successfully complete 8th-grade algebra and at least two math courses in high school, thereby increasing the number of students completing graduation requirements for higher education. The ESA aims to increase the number of students enrolled and succeeding in calculus and other Advanced Placement courses. Importantly, the ESA set a goal to accelerate the completion by Latino/a and African American students of the A-G graduation requirements for entrance to public universities in California.

These are ambitious goals for the multidistrict, disparate, and diverse ESA. Furthermore, reflecting residential patterns, student demographics vary among the schools in the high school district and among the k–8 districts. For example, in 2016–17, the proportion of students eligible for free or reduced-price meals at Evergreen Valley High was 16%, whereas at James Lick High School it was 82%. In the Alum Rock Union Elementary School District (ARUSD), 92% of the students spoke a language other than English in their homes and were classified in various categories of English proficiency: 19% as Redesignated Fluent English Proficient (RFEP), 29% as Fluent English Proficient (FEP), and 44% as English learners (EL). In the Oak Grove Elementary district, 9% of the students were categorized as RFEP, 16% as FEP, and 29% as EL.[60]

This kind of range in student background characteristics has significant implications for students' learning needs and the instructional challenges facing the teachers. To accomplish its goals, the ESA understood the importance of leveraging resources and aligning courses and instructional approaches in mathematics among the high schools and their feeder schools.

Professional Learning in the East Side Alliance

The ESA offers three kinds of professional learning opportunities to teachers whose districts and schools are part of the initiative: math symposia, organized by the ESA for mathematics teachers from all member districts; professional learning communities (PLCs) for high school and middle school mathematics teachers; and convenings for upper elementary school (grades 3–5) teachers to learn together.

The ESA holds three math symposia per academic year. For example, in 2017, the first math symposium featured Stanford Professor Jo Boaler, who presented strategies and activities that support growth mindset and help teachers show students that they can enjoy and succeed in math.[61] The second math symposium introduced the Teaching for Robust Understanding framework, a set of research-based tools to support mathematics teaching and professional learning.[62] Close to 100 teachers attended the third symposium, during which an ESA math toolkit was rolled out for a second review by the teachers.

High School/Middle School PLC (HS/MS PLC) meetings consist of the high school and partner feeder district teachers discussing issues originating from the math symposia in more depth. We observed a PLC meeting led by an ILC member: Teachers discussed the use of peer mentoring to foster a growth mindset, teaching strategies with which they had experienced success, whether and what kind of homework could support student learning, and additional resources to support lesson planning.

Whereas in previous years the ESA focused solely on high school and middle school mathematics, during the 2016–17 academic year teachers in the upper elementary grades 3–5 convened to learn innovative instructional methods through a collaborative process. As a follow-up to this special symposium, teachers had the opportunity to enroll in an online course offered by Stanford University. The 30-hour online course was available for all k–12 teachers, and nearly 90 teachers participated.

Two ILC members and two additional teachers who participated in these learning communities in the ESA shared videotapes of their classrooms with their colleagues. Together they analyzed how the teacher whose videos they were watching used some of the strategies introduced during the collaborative meetings. Participating teachers also discussed samples of student work from their classrooms. These activities were powerful learning opportunities for the teachers and reinforced collegiality, mutual trust, and respect.

The Instructional Leadership Corps in the East Side Alliance

In this environment of frequent and relatively large-scale professional learning opportunities for ESA teachers of mathematics and of elementary grades, members of two ILC teams planned and delivered workshops and other learning opportunities for teachers in their home districts. In this case study, we focus on Team Jasper, active in the Mount Pleasant Elementary and Oak Grove Elementary districts, and Team Amber, active in the Alum Rock Union Elementary School District.[63] Bernadette Salgarino, a member of the ILC, a former mathematics teacher, and at the time of our study, a mathematics coordinator at the Santa Clara County Office of Education, was charged with supporting professional learning at the ESA and has been a significant member of both teams.

Team Jasper: Focus on vertical alignment

In 2015, the second year of the ILC project, Bernadette (who led the HS/MS PLC meetings) and Keely Elizabeth Berg and Shannon Soza (both of whom had been supporting professional learning through ESA activities) joined the ILC. Keely was an assistant principal and an instructional coach and had participated on a project titled Building Educator Assessment Literacy (BEAL), led by WestEd.[64] Shannon was a math teacher in the Mount Pleasant district as well as a Teacher on Special Assignment (ToSA) for coaching support. The three of them formed what we call Team Jasper.

During these collaborative professional learning events, teachers could probe more deeply into themes raised during the symposia and develop a common language for discussing mathematics content, instructional practices, and assessment—particularly formative assessment. These events thus strengthened vertical articulation between the high schools and the feeder k–8 schools. In 2015–16, Team Jasper led four groups of mixed-grade mathematics teachers in a two-session workshop series, reaching about 80 teachers.

Bernadette explained that greater vertical articulation, i.e., alignment of courses and instructional practices across grade levels, was needed to help middle school teachers support their students' transition to high school. For example, as James Lick High School was adopting the New Tech program, it began to emphasize interdisciplinary classes (e.g., two subjects in one block period) and project-based learning, in which students work in small groups on real-world projects for 6 to 8 weeks and present their work to a panel of community members. Given that many different districts feed into one high school district and that districts are not aligned in terms of content, skills, or practices taught, students arrive at the high schools with varying experiences and skill sets. An abrupt transition from middle grades to high school can impede students' potential for success.

Adoption of the new CCSS-aligned mathematics textbooks further increased the need for vertical alignment and opportunities for teachers to have continuous conversations. In the ESA, teachers and administrators found it essential to think across grade levels when adopting the new textbooks.

The formal inception of the ESA's ILC team provided a mechanism to extend the team's ESA work on two levels: in larger settings and within their own districts. Keely drew on key themes the team had explored together, formative assessment among them. She also presented at numerous large venues, such as the Good Teaching conferences of the California Teachers Association (CTA). Together with Bernadette and Shannon, she led professional development workshops at her own school site and conducted two sessions on formative assessment to 41 of the 43 staff members in the Orchard Elementary School District, including k–8 teachers, administrators, psychologists, a resource specialist, and special education teachers. The team focused on collecting information about students' level of comprehension, learning needs, and progress during a lesson or a unit, valuable practices for assessing student learning as well as an important part of teacher learning. The team was thus able to be responsive to both teachers' and administrators' expectations for using formative assessment in mathematics and across other subject areas. Keely said:

> Formative assessment is a huge trend in education right now, and everyone says they're doing formative assessment. To me, there was a need to provide clarification. Teachers are being asked to do formative assessment; principals [and] superintendents are expecting formative assessment to take place. I also wanted something that spanned all content areas, since my focus as an instructional coach was general content areas. And it's transferable. A strategy that works in social studies can also work in science or ELA.

In early 2016, Team Jasper extended its work into Shannon's home district, Mount Pleasant Elementary. At that time, this five-school district served about 2,400 students in its three TK–5 elementary schools, one grade 6–8 middle school, and one TK–8 district-sponsored charter school. Most students (74%) were of Latino/a background, and 47% were classified as English learners, 40% of whom spoke Spanish as their home language. Around 80% qualified for free or

reduced-price meals. CAASPP assessment data showed that overall student achievement in ELA and mathematics in Mount Pleasant was below that of the state average—in 2016, 32% of the district's students met or exceeded state standards in ELA and 29% in mathematics, compared with 49% and 37%, respectively, statewide.[65] However, the achievement of socioeconomically disadvantaged students in Mount Pleasant increased significantly in 2015–16 to rates greater than those of other disadvantaged students in the state.[66]

The three members of the ILC team ran three PDWs, for a total of six sessions for the k–2, 3–5, and 6–8 teachers in the district. Focusing on formative assessments, they introduced clickers to collect, record, and display students' responses in real time, among other tools. Close to 75% of teachers participated in the workshops. Between the HS/MS PLCs and the extended work in the Orchard and Mount Pleasant districts, Team Jasper reached nearly 250 teachers with multiple workshops from October 2015 to January 2016.

A middle school teacher who participated in these collaborative meetings described what and how she was able to learn through the varied activities and the different topics covered:

> Every meeting had a different focus. So, some meetings were focused around collaborating with high school teachers and junior high [teachers].... What do we as junior high teachers have to do in order to help our students get prepared for high school? ... They would show us a lot of statistics and why we as a team need to collaborate and use different strategies like formative assessments. And we also focus on the SBAC questioning a lot with the East Side Alliance.[67] And it just gave us a better idea of what the state is looking for as far as the answers to the type of questions there's going to be on the CAASPP test and then the answers that they're expecting and how to move from there. At other workshops they would try different math games and math strategies with us in order for us to learn how to really think differently and help our students to think more creatively.

Shannon extended the work of the HS/MS PLCs by organizing a series of mathematics-focused PDWs in Mount Pleasant. These PDWs were known as "Moonlight University"—a name chosen because the workshops were held in afternoons and evenings. She emphasized that each Moonlight University session was designed to respond to teachers' present learning needs while drawing on the content of the symposia and of the collaboratives: "When I am at Mount Pleasant, I really try to focus on what the Mount Pleasant teachers want," she said.

"Moonlight University"—a name chosen because the workshops were held in afternoons and evenings—was designed to respond to teachers' present learning needs: "When I am at Mount Pleasant, I ... focus on what the Mount Pleasant teachers want."

She noted that many teachers in the district struggled with responding to the wide range of performance and achievement of students within a single class. With the rigorous demands of CCSS, the team's focus was supporting elementary and middle school teachers in responding effectively to students' individual learning needs. This challenge was magnified as teachers were asked to support their students in thinking about

mathematics as more open and flexible than a collection of algorithms. The preponderance of word problems also required that students develop increased language proficiency. This was important given the many English learners in the district. Students were asked to deconstruct and interpret the text of the problems to be able to understand the mathematics involved and thus respond appropriately.

A 6th-grade teacher we interviewed explained the challenge he and others were facing:

> Well, most certainly [in the past] I learned how to do algorithms. That's it. Get the solution, not think about it.... Now, it's about talking about and explaining the process [and] utilizing the correct vocabulary.

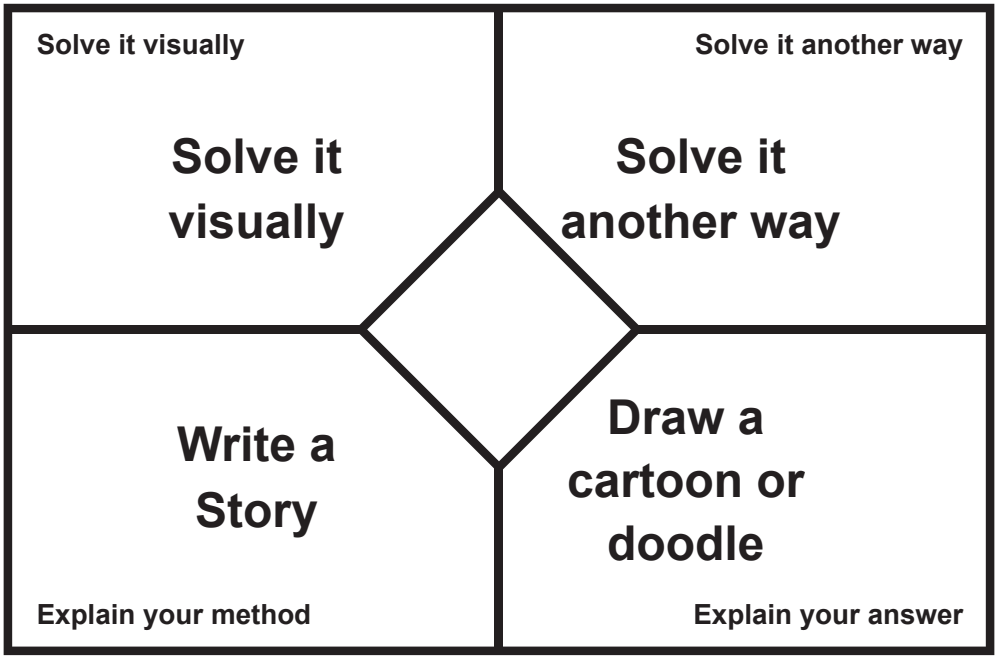
He described how the CA CCSSM assessments required different and higher levels of thinking than previous state tests:

> I would say the students in my classroom, [when] I'd give them the STAR test ... they blow it out of the water, incredible.[68] [But when] they take the interim assessment, I have almost a 60% failure rate. So, this whole ideology of switching over to being able to explain things, having the vocabulary to do it, and having the patience with the students in order to get them to that level was very pivotal to moving them over. It takes work. Lots and lots and lots of work, both from the teacher and themselves.

Moonlight University provided targeted professional learning opportunities to support CA CCSSM and Next Generation Science Standards (NGSS) implementation, as well as programs in ELD and use of technology in the classroom.[69] As part of her work with the ILC, Shannon organized and delivered workshops for mathematics teachers from two middle schools in the district. Shannon's forethought and flexibility in scheduling the workshops by sending out Doodle polls to find times that worked for most was recognized and appreciated by the teachers. One participant noted, "If she didn't do that ... it probably wouldn't work because everyone is so involved in different committees and everything in school."

Participating teachers met approximately six times each academic year. In the 2015–16 academic year, they focused on subjects ranging from teaching fractions, first introduced in 3rd grade, to fractions and decimals used in algebraic expressions, and to equations in 7th and 8th grades. In the 2016–17 academic year, the focus of the workshops was formative assessment, an extension of the ESA mathematics symposium. The first session dealt with specific formative assessment strategies, such as creating pre- and post-unit assessments and intermediate checkpoints, analyzing data to gauge student growth, giving opportunities for students to revise work, and using strategies such as exit tickets to check student understanding.[70] Subsequent sessions covered elements of teaching mathematics presented in *Visible Learning for Mathematics, Grades K–12: What Works Best to Optimize Student Learning*,[71] a resource provided to ESA mathematics teachers as part of a Bill & Melinda Gates Foundation grant to Silicon Valley Education Foundation and the ESA. The book identifies the relative effectiveness of several research-based mathematical teaching practices and clarifies when and how these practices are most useful. Sessions following Jo Boaler's presentation at the math symposium included topics such as number talks and a graphic tool called paper diamond,[72] a visual that reminds students to use different ways to solve a problem. (See Figure 8.)

Figure 8
Template for Paper Diamond



Source: From handouts at ILC East Side Alliance professional learning workshops.

The format of the workshops followed the ILC's structure. Each workshop started with a review of the previous session to reinforce teachers' previous learning, and then participants shared and reflected upon their efforts to implement specific strategies. Each workshop had time set aside for collaboration. A participating 6th-grade teacher said he usually used this time to discuss with his colleagues on the 6th-grade teaching team how they could incorporate the newly learned strategies into their daily work in the classroom. The teachers also discussed mundane, yet important, logistical issues, such as who would make copies and who would gather resources for the team. Another participating teacher reported that collaboration time allowed her and her colleagues to connect the specific strategies and practices to College Preparatory Mathematics, the school's mathematics curriculum, which was in its second year of implementation.

We observed a workshop held in Shannon's classroom at August Boeger Middle School in San Jose in March 2017. Nine teachers seated in two groups participated at this event. At the beginning of the session, a teacher described how his students reflected on their own learning growth. Another teacher, who had used the paper diamond tool, noted the difference between the previously high-achieving students' continued preference for algorithms and the lower-achieving students' openness to using visuals. A third teacher confirmed that the use of visuals helped to clarify her students' understanding of different kinds of angles. Next, the group turned their attention to number talks, a classroom routine designed to support students' sense of numbers and operations as well as ways of communicating about mathematics in the classroom. In a number talk, the teacher poses a math problem and asks the students to share how they would solve it mentally. Students then discuss the different ways their peers approach the problem. Shannon modeled a number talk during the session.

After viewing a video, the teachers discussed their experiences to date implementing the technique. Shannon then introduced "fists of five," an additional technique used in some mathematics classrooms. Using 15 × 65 as an example, she demonstrated how students holding a closed fist against their chest would unfurl their fingers one by one as they think of five different ways to solve the problem. Participants were called upon to write their solutions on the board. Subsequently, pairs of teachers took turns practicing number talks.

During the second part of the session, the group focused on a stepping-stone protocol to prepare students for CAASPP word problems. The protocol includes five steps:

1. Review the problem
2. Address any student questions
3. Give students time alone with the problem
4. Discuss as a class
5. Teach a mini-lesson based on the problem

In a lively discussion, teachers commented on, practiced, and offered suggestions on how to use the protocol in their classrooms over the course of a week for the benefit of their students' learning. Next, Shannon demonstrated how an exit ticket used to tap into student thinking and understanding can be folded into the protocol. The last part of the session was dedicated to teacher collaboration and planning.

Moonlight University workshops reflected many features of high-quality professional learning: Teachers were able to learn about new practices, iteratively improve upon their implementation, and progressively integrate them into their teaching repertoires. The content of the workshops was relevant to the participating teachers' needs and explicitly connected to the district curriculum and to CA CCSSM. The flow of activities was well planned and well paced. The introduction of a variety of participant structures (e.g., observing the teacher modeling a strategy, small group discussions, pair work), different instructional strategies and tools (e.g., video), and opportunities to practice led to lively discussions and full engagement. Shannon facilitated the session with skill and grace. The workshops provided excellent opportunities for professional learning.

Many participating teachers gave the Moonlight University sessions positive feedback on post-session surveys by writing comments such as, "Analyzing student work and coming up with strategies was effective," "It's helpful for me to know where my students are and what standards to revisit, " and "I learned new strategies to help target the needs of students who are far below grade level."

The PLC created by these sessions was akin to a think tank, according to one of the participating teachers. He saw the sessions as an opportunity to reflect with colleagues; get to know about and assess each other's teaching; and learn, share, and pool strategies for improving instructional practice in their classrooms. He noted:

> [There] was also self-reflecting, really looking deeply at our own depth and knowledge of the subject matter as well as how we are presenting it. Are we directly teaching? Are … the students [working on] difficult enough problems [that push] them to really understand just how the math works? Everybody really came together to put forward a lot of different ideas.

One participating teacher acknowledged that she learned instructional strategies at the Moonlight University sessions that were helpful beyond her mathematics classes. She valued the opportunity to practice the new teaching strategies as a teacher and to experience them as a student.

> [In] the first Moonlight, we went over more of the data: Why we need certain things [such as] formative assessments, and why … we need to give feedback to our students. From there we went into implementing, [including] practicing different strategies [and] being students. We [often] don't know how it feels to be a student anymore. Because we're teachers, we're so used to telling … our kids what needs to be done and teaching them that we forget how to become students.

Team Amber: Determined to learn and lead

The ILC team we call Team Amber conducted activities in the Alum Rock Union Elementary School District (ARUSD). One of the neediest districts within the East Side Alliance, ARUSD serves close to 11,000 students in its 14 elementary schools, seven middle schools, and three k–8 schools. In this district, the proportion of students who qualify for free or reduced-price meals is over 85%. The district reports 42 different languages spoken in the homes of the district students. Close to 45% of the student population is classified as ELs, 40% of whom report Spanish as their home language. Student enrollment in the district has declined steadily during the past 7 years and is down by about 13%.[73] Since 2012, student enrollment in charter schools has more than doubled.

Over the years, local newspapers reported periodically about considerable turbulence, financial irregularities, and lack of stability, with frequent changes of district superintendents.[74] The district also experienced high teacher turnover, a further potential impediment to sustained student progress. For example, the district's estimated number of teacher hires was above 15% for each of the three years from 2014–15 to 2016–17.[75] While recognizing veteran teachers' considerable expertise in the fundamentals of teaching and knowledge of their teaching context as significant assets for the district, a district representative noted two major concerns: recruiting highly qualified teachers to replace those leaving and the need for continuous professional learning required of both novice and veteran teachers to implement the CCSS.

To address the challenges that are unique to each site, each school's instructional leadership team, consisting of the principal, several teachers, and a site-specific instructional coach (at times shared across two or more sites), was charged with developing its own theory of action. A teacher we interviewed described the process as follows:

> We have, let's call it, the theory of action. It lists things that, as a school, we decided we were going to strive for. For example, one of them is having student centers, and some teachers are super strong in having those centers set up already. Other teachers need more assistance because they are maybe unaware of how to set it up and haven't done it in the past. One teacher may need to do some coaching cycles around how to set up those centers and what that looks like and what students should be doing independently, while they may be working with the group. For other teachers, it may be looking at data. We use this program called iReady for reading and math, and we could look at the data in iReady and they might say, "Well, I can see that my class is struggling in this particular domain. What can I do … as maybe mini-lessons or interventions to help students be stronger in this particular domain?"

The ILC teams provided a mechanism for teacher input into schoolwide goals and offered strategies for achieving them. Periodically, the district hosted meetings to form a PLC that could provide input and assistance to the schools. Our observations of Team Amber revealed the potentially beneficial impact of teachers' local agency.

Members of Team Amber included Kasturi Basu, a former teacher and, at the time of our study, a site instructional coach at two district schools; Nate Dawson, a former 3rd-grade teacher, a local union leader, member of the ILC design team, and peer support provider for four ILC teams in the ESA; Danielle Letts, a 4th-grade teacher; and Bernadette Salgarino from the Santa Clara County Office of Education and a member of Team Jasper, who had begun to work with Team Amber. Danielle replaced a teacher from another district who withdrew because of lack of support from her home district. Danielle explained that she joined the team to help provide professional development that was effective in shifting practice because of her own experiences. She felt that she had participated in too many workshops in which presenters were unable to refer to or adjust their message for the local context.

Team Amber began leading PDWs in early 2015. ILC members of the team began their PDW work at their own school sites and reached out to parent and community groups to share information and garner support. Based on an agreement between the district and the local educators association, and using funds available under the Local Control Funding Formula, teachers could receive an hourly wage for attending the workshops. Despite this monetary incentive, attendance at the early workshops totaled around 75–90 teachers, a good number, but short of the 150 the team was hoping for. Kasturi shared some of the struggles the team encountered:

> I think we had a hard time, very hard time, with a lot of things. First of all, picking a focus area was hard because the first conference we went to, we got a lot of information. There was so much going on, and we decided on giving PDs, but it was kind of scattered. We didn't have a focus area, so [we] were doing ELA PD and we did NGSS PD all over.

Attracting teachers to the PDW events held after school was particularly challenging. A representative from the district office noted:

> That's the hard part. Getting people invested in wanting to come after school. We pay, we have food, we try to make it a nice event, but I think for teachers, they're tired after school and then they have to prepare their lessons, and sometimes they have other obligations, and it's something that is hard for them to commit to.

There were additional challenges: Members of the ILC team struggled with finding shared time to plan the workshops in addition to planning for and teaching their own classes. They were further frustrated by not being able to be more responsive to colleagues' requests for ongoing support with such things as model lessons, classroom observation, or co-teaching without release time for planning, observing, coaching, and organizing substitute teachers. Because these PDWs were open to teachers from schools across the district, coordinating teaching schedules and arranging substitutes or coaches to cover became unmanageable.

A regional ILC conference in 2015 was a particularly important moment for Team Amber. At this meeting, the team met Bernadette, who was already active with Team Jasper. The team and Bernadette agreed to join forces and align their work. Together they approached the district with a plan in which Team Amber would support the county's mathematics professional development

work in the district. Their coordinated efforts offered valuable credibility and increased Team Amber's legitimacy to provide professional development to the district teachers. It helped overcome initial skepticism from the district regarding their capacity. Kasturi said, "Since we got the county involved, it made a huge difference. Now they actually feel that we are doing very legitimate work and we are helping teachers."

Nate recognized the benefits of Bernadette's knowledge of texts and resources and her overall enthusiasm and experience with professional development:

> We were looking just at a list of the Standards for Mathematical Practice and talking about what type of activities connect to that. This year, she was excited about the Jo Boaler *Mathematical Mindsets* book and the John Hattie Impact book [*Visible Learning for Teachers: Maximizing Impact on Learning*], and we're using both of those for the second-year students. It was that infectious excitement, where it's like, "Oh, this is so cool! I'm getting this book right now!" And then, our district was willing to get the books for everyone who attended.

Team Amber encountered professional learning needs in ARUSD similar to those identified in other ESA districts. A 30-year veteran elementary school teacher in Alum Rock commented:

> Common Core for me meant a complete change in what I knew. I was required to teach them how to explain a concept, whereas before I always started teaching the way I learned how to do the math. It was standard algorithm. Boom, pump it out. Here's step one, step two, step three. But with Common Core it forced me to really understand what the algorithm was doing, and so I think it was really hard for teachers because we weren't necessarily taught why things happened in math.

Expected instructional shifts were indeed the most difficult goal to reach. A district representative echoed the teacher's message:

> We are not seeing the shift in instruction with math. Just still a lot of drill-and-kill, practice facts. Not really understanding the type of thinking and the dialogue that needs to be happening in the classrooms, for kids to be able to grapple with these more complex math problems. Just the same kind of instruction that we have always seen. We have new curriculum, but [the teachers] were skipping parts that were more representative of what you would think Common Core would be.

Kasturi recognized that although professional learning in the district had provided opportunities to orient teachers to the new curriculum and the new standards, there was limited follow-up. Consequently, Bernadette added, because many teachers were not ready for the change, they reverted to direct instruction. A different approach to professional learning was needed.

The six-part PDW series in 2016–17 became the appropriate response. The workshops, offered to 25–30 teachers in grades k–5, focused on the Standards for Mathematical Practice (SMPs) and on how to integrate them with the content standards. Two mathematical practice standards were addressed each session, together with strategies to promote them in the classroom. Danielle described the series as follows:

> In our first session, we did an overview and then we worked on Standards for Mathematical Practice 1 and 6 because those are the overarching ones. They

> pretty much tie in every math lesson you are doing. [They] focused on one or two strategies for teachers to try out in their class, focus on the SMPs, and then come back. Then about a month later, we met again, and we always started with a check-in: How did it go, what did you work on, what was successful, what did you try? Then we would focus on two more SMPs and some new strategies that tied in with the SMPs a little more, and then gave them time to plan and prepare to take it back to their classroom. So that was the basic structure for the first four sessions.

The PDWs taught specific pedagogical skills, including activities, math games, and assessments. For example, spider math is a game in which the class uses spider webs to model operations with integers. In the three-act lesson,[76] the teacher shows students an image or a video in Act 1 to pique their curiosity. In Act 2, students formulate mathematical questions related to what they saw and gather the information they need to answer the questions. In Act 3, students construct mathematical models of the situation and compare their models to the real world. Danielle explained:

> It starts with something just to get them thinking, and it might have been an image, might have been a short video, might have been just something for them to be kind of like, "Huh, what could that be?" And then it might go in more depth. For example, the one that we demonstrated was a video about a package of cookies. They opened them up and took some out. "Well, how many did you see in row one? How many are in row two? So how many do you think would be missing because you only see part of row three? So what strategies could you use to try to discover how many cookies were taken, or how many cookies were there in all?" So, teachers design [lessons] around different topics, but it was based on a question after some kind of introductory prompt.

The three-act lesson served as a framework for folding in other tools, such as number lines and number webs, recognizing geometric patterns, and designing charts.

Just as it did in Moonlight University, number talk became a core strategy at these PDWs. It promoted a dual purpose: conceptual understanding of mathematics and the development of disciplinary discourse, a particularly urgent need given the large number of ELs in the district. A participating teacher said:

> One of the strategies we did was we talked a lot about number talk, one of my favorites. That's one of the strategies we did in our very first session because it makes kids have to talk, and they have to listen, and as they hear their peers more and they get more exposure and more experience with it, they get better and better at it. With number talk, my job as the teacher isn't to tell the kids how they thought about it. They tell me what they thought. But yes, I can help interpret and clarify for my students, and sometimes that includes using the vocabulary and helping them find that right word, helping support them in that vocabulary development.

The format of each session was designed to provide opportunities for teachers to learn with and from each other and gain multiple perspectives on teaching strategies. These included pairs, table groups, and grouping by grade level, allowing teachers to share experiences and strategies across schools and grades. During the last session of the series, participating teachers reflected on their experiences implementing the newly learned strategies, shared samples of student work, and reflected on what went well and what changes they needed to make for next time.

In January 2018, we observed one of these 2-hour after-school sessions at Millard McCollam Elementary School in San Jose. Four members of Team Amber took turns leading different parts of the workshop, which was attended by nine elementary school teachers and resource specialists. Following the regular protocol, one ILC member opened the session with a review of the vision statement and the specific goals for professional learning as described in district documents. In a quite rapid and decidedly engaging order, the presenters and the participants reviewed and practiced a series of instructional strategies that present opportunities for students to make sense of problems, think about ways to solve problems, and propose viable arguments. For example, the participants worked through several examples of number talks and a three-act lesson by discussing the problems in their small groups. While one of the workshop leaders facilitated the debrief of the activities, the teachers were able to identify and connect their experiences to the descriptions of the Standards for Mathematical Practice as presented in the CA CCSSM. The workshop leaders asked teachers to plan and teach a three-act lesson before the next meeting and report to the group about the outcomes of the lesson.

The workshops that focused on mathematical practice were successful, and the feedback from participating teachers was positive. As a result, the district asked Team Amber to continue its work in two ways: to offer a second series of workshops focused on formative assessment and to contribute to the workshops offered during the dedicated professional development days.

Danielle, one of the presenters, explained:

> What ended up happening was that [the first series] was very well received in our district by the teachers and our district office. So they asked us to work with the county office again and create a second PLC. That started a second PLC group, which was a series of five, and this was 3rd- through 5th-grade teachers.… We were still focused on math, and we were still working with Bernadette from the county office. We were focusing on formative assessment, providing feedback for students and starting to break down performance tasks and looking at what students are asked to do and, based on the standards and also based on SBAC, what that looks like in the classroom, as well as for student performance.

Given that Alum Rock teachers' contracts require them to participate in three professional development days hosted by the district prior to the start of the school year, the ILC scheduled several workshops during summer 2017. In June, ILC members Danielle and Nate led a daylong version of the mathematical practice series. Kasturi, the third ILC member, led a session on the NGSS for elementary school teachers that was attended by approximately 65 teachers. A second whole-day mathematical practice workshop was held in August 2017.

Team Amber's workshop offerings continued into the 2017–18 school year. Teachers who had completed the series the previous year asked for more. The ILC team responded by offering a Year 2 series focused on lesson study. The goal of these workshops was to urge teachers to observe colleagues' classes, provide feedback, and continue to further develop each other's instructional practice. When Kasturi became a site-based instructional coach, she expanded the professional learning opportunities to more district teachers. She established two mathematics-focused PLCs at two schools, with 24 and 15 teachers enrolled, respectively.

The value of the ILC team's work was further demonstrated by the organic development of trusting collegial relationships within the district through targeted collaboration. Two teachers who had participated in workshops took on new roles as instructional coaches, one with the district and another at her school site. One of these new coaches said she relied on her experience at the workshops as she planned content and resources in her new position.

The value of the ILC team's work was further demonstrated by the organic development of trusting collegial relationships within the district through targeted collaboration.

In Alum Rock, ILC teacher leaders were also able to navigate difficult terrain. When negotiations between the district and the Alum Rock Educators Association stalled in 2016, two ILC teacher leaders, also members of their union's executive board, were able to maintain dialogue with district representatives about the ILC's work, ultimately emerging from this period as productive partners in offering professional learning. Their activities increased the district administrators' confidence in the work of the team and contributed to the development of mutual trust.

Different contexts under one umbrella: Team Amber and Team Jasper

The two ILC teams highlighted in this case were part of the East Side Alliance, a formal partnership of several districts. Their respective participation in the professional learning activities offered by the Alliance varied given the specific circumstances of their home organizations. The juxtaposition of the activities, accomplishments, and challenges of the two teams reflects the consequences of political, financial, and structural arrangements in the different districts of the Alliance.

Nate, an elementary school teacher and member of the CTA, was involved with the statewide ILC project from its inception as a member of the design team. Yet, given challenging fiscal and political circumstances in the district, the activities of the ILC team in Alum Rock USD were only loosely connected to the professional activities offered by the East Side Alliance. The situation changed once all Team Amber members came from the same district and connected with Bernadette from the Santa Clara County Office of Education. Bernadette was tasked with designing, initiating, and implementing the CA CCSSM for the whole county, and she was particularly attentive to ARUSD because she recognized it as the district with "the greatest need." Her active involvement and formal joining of the ILC team energized and boosted the team's efforts and success.

Bernadette was also an active member of Team Jasper. Shannon, Keely, and Bernadette had been organizing professional learning activities for ESA districts even before joining the ILC in Year 2. By relying on the positive reputation, professional resources, and support of the statewide ILC project, Team Jasper was able to expand and deepen its earlier work. Bernadette's membership in both teams allowed her to make productive connections and to participate in PDWs offered by ARUSD. As a former teacher, she facilitated and supported both teams in the essence of the ILC: teachers teaching teachers.

Teacher-Led Professional Learning Takes Root in the East Side Alliance

In just 3 years, the ILC teams' work in the ESA helped embed a culture of teacher-led professional learning among educators. The teams were intentional in how they built collaborative partnerships and garnered administrative and financial support from various organizations, institutions, and district offices. For example, they secured and benefited from resources and relationships with the Santa Clara County Office of Education, the respective home districts of the ILC team members, teachers associations, and the Silicon Valley Education Foundation.

In just 3 years, the ILC teams' work in the East Side Alliance helped embed a culture of teacher-led professional learning among educators.

Team Amber and Team Jasper both did much to engage and build relationships with their respective district offices. Given the positive feedback from teachers, the districts were willing to commit resources to support the ILC teams' work. Mount Pleasant Elementary School teachers were paid their negotiated hourly rate for attending the workshops, totaling approximately $75 for shorter workshops and $100–125 for longer ones. The district also provided food for those participating in after-school workshops.

Teachers took note of this support. As one observed:

> Our district superintendent is very passionate about the math program—just about education in general—and really wants to promote teachers learning more and implementing more strategies and getting more practice.... I feel like in a way she fights for us to get what we need and also just to motivate us. They'll bring us snacks, they'll bring us some kind of dinner, they'll give us our hourly pay and everything, just as a thank-you and to motivate us as well.

ARUSD paid extended duty to attending teachers for participating in the workshops, amounting to the equivalent of $600 for those who attended all six in the series. ILC team members also received extended-duty pay for leading and planning workshops. The district ordered and paid for the recommended books and provided food and snacks. And, critically, the district hired substitutes to teach participants' classes so that they could attend ILC conferences and workshops.

Team Amber kept the district informed and was transparent about its plans, which increased the district administrators' confidence in its work and contributed to the development of a mutually trusting relationship. Danielle, a member of the ILC team, said:

> I think our district knows all three members of our team: They know who we are, they know the work that we do, they know what we're trying to do, and we've met with them every time we've come up with a plan. We always tell them what our ideas are and where we want to help, so I think we've been very open in that.

The ILC workshops had become an integral part of the professional development offerings in ARUSD. "It's one of our main PDs," said a district representative. As such, the workshops continue to be included in the professional learning calendar, and emails, flyers, and reminders are sent out to teachers. After positive feedback from the series of workshops, the district asked the team to develop a formative assessment workshop series, to lead sessions as part of the district's PD days, and to develop a program of lesson study PDWs in 2017–18. A district representative said she appreciated that ILC members were open to their ideas and that they volunteered to create and lead sessions as part of the district's PD day, such as a much-needed introduction to the NGSS for elementary school teachers.

To assist the team in planning and facilitating workshops, the district appointed an instructional coach for the 2017–18 academic year whose responsibilities included supporting fellow coaches and participating in a district-led Instructional Leadership PLC that consisted of school principals and site-based instructional coaches. The PLC met regularly to examine data, plan, and support the development of school-level theories of action for improvement. Bringing together the instructional coach and the ILC team was thus another mechanism for integrating the work of the ILC with district planning and structures.

Teacher learning and leadership development

The mathematics symposia and the PLCs reached notable numbers of attendees within the ESA districts. In addition to breadth, the ILC-led workshops added depth in how teachers implemented the instructional shifts required by the CA CCSSM. For example, a middle school teacher who had attended the Mount Pleasant Moonlight University workshops described how her participation had boosted her confidence in her abilities as a teacher and helped her maintain her enthusiasm for teaching. She ascribed the changes to having learned and practiced concrete teaching strategies to support her students' learning needs:

> [My teaching] definitely has changed because of all the workshops that I've been a part of, with Moonlight University and even with East Side Alliance. I am now a better math teacher. I was able to learn different strategies to make math more fun. It's just a great program to be a part of, and I'm so grateful because honestly, without everyone's help, I'd still be stuck doing the same old things. It's been such a positive experience.

She also talked about the tools acquired during the workshops that helped her analyze and reflect on her teaching. For example, gauging the depth of knowledge levels in her questioning contributed to her understanding of ways to push her students' learning forward.

Another participant in the Moonlight University workshops listed several strategies (e.g., formative assessment) and tools (e.g., gallery walks, exit tickets, fishbowls) that helped him engage his students more deeply than he had before. Practicing formative assessment reshaped his instructional approach. He collected and analyzed data from his formative assessments to identify students who needed further or different kinds of support. By introducing the notion of retakes, he could offer individual coaching and an additional opportunity to students to demonstrate their competency and achieve a passing grade. He assigned peer mentors to students who needed assistance in developing English proficiency. He also became more aware of his own use of switching between informal and formal academic classroom discourse.

This teacher also reported that he adjusted the flow of his lessons. He refrained from front-loading vocabulary and allowed students to develop concepts before naming them. He further supported language development by giving students multiple opportunities to collaborate as they practiced articulating and providing feedback to each other's mathematical reasoning.

Shannon, the leader of Moonlight University, recognized areas in which further work with the teachers was needed. The way teachers calibrated assessments and grading was one such area. As teachers shared student work samples during the workshops, Shannon uncovered the need for greater alignment and coherence and the need to continue discussing and elaborating on topics of assessment and grading. She commented:

> And then we are going to have to continue talking about grading. We're having differences between our retakes, and how we grade our retakes, and what [the students] have to do to be able to show that they've mastered to be able to retake.... Every teacher is different, so we need to align better. Because what I do in my class for retakes is different from what [another teacher] would do.

In ARUSD, teachers attested to the positive impact of the workshops led by Team Amber members. One teacher indicated that by paying attention to the content standards, she was able to focus her instruction and start teaching the district's CCSS-aligned curriculum. Given her responsibilities for supporting students with special learning needs, this development was particularly important and relevant for planning her year.

Another teacher saw value in attending the workshops with teachers from her school. As a group, they could share information and resources with other teachers at their school by using Google Docs or by making and distributing copies. In addition, during collaboration time, she connected with a colleague from another school, and together they created new resources that they tested and further refined based on their experiences with their students. She explained:

> Working with another teacher from another campus, we created flip charts together for the lessons we were going to teach, so we were kind of assisting each other. I was showing her how to do them to make her life a little easier on her campus, and then we would work together to make them, so I didn't feel like I was doing the flip chart all on my own. As she learned how to manipulate it a little bit more, we taught [the material] to our kids. When we came back, we always had a little homework where we learned something, and [the workshop leaders] are like, "OK, try it out with your students and then bring back student evidence that you did it, and then we can talk about it." That was beneficial, too, because we would teach it, but then we would get different outcomes because we have different groups of students. It was nice to also hear how students interpreted that particular activity, so that was also so helpful. We learned a lot from each other doing that as well.

The emphasis on expecting students to articulate their mathematical reasoning helped this teacher make connections to ELD standards. She noted that it also helped her in her new role as a site instructional coach: "I've been having to go to all these ELD trainings; so, I'm finally starting to see this bigger picture of how we needed to be doing things."

ILC members and district representatives gave differing accounts of the impact of the PDWs on teaching practice. On the one hand, one of the ILC members, expecting broader and deeper changes to happen more rapidly, characterized the impact as "minor to mild." On the other hand, the uptake from the PDWs by teachers had not gone unnoticed by the district office. A district representative shared with us that during school walk-throughs following Team Amber's PDWs, she observed teachers practicing the strategies presented as well as students building models with manipulatives and articulating their ideas using academic language. She thought that teachers were more engaged with the particularly challenging parts of the curriculum, something they had avoided in the past. She noted:

> In our math curriculum, we have something called project-based interactive learning. It's like this one little segment where you don't necessarily give the kids instruction on how to solve this. They get the manipulative, they get the problem, and then they have to think through with a partner how [they] might work through this problem. That's always hard for [them]. It's supposed to be a productive struggle, coming up with different ways of solving a problem. Many teachers skip that part because it makes them uncomfortable, seeing kids not come up with [different ways of solving a problem].

> Being part of the ILC teams has also had beneficial outcomes for the team members, both personally and professionally. They learned that their leadership, their knowledge, and their expertise are recognized and valued by their colleagues, schools, and districts. More specifically, they learned how to express themselves as professionals among their colleagues; how to work as members of teams with a common goal; and how to plan, organize, and lead professional development workshops.

The opportunity to work with other teachers was stimulating and motivating. Bernadette, a former teacher, said that involvement with the ILC increased her engagement and helped her focus on student learning by "grounding" her to work with "teachers who have a different view of teaching. When we get together and we talk about it and plan it, it's different. It's positive. It's all about kids.... [I]n a room full of awesome teachers, you just grow yourself."

ILC members, experienced teachers themselves, valued opportunities to deepen their knowledge and refine their skills. Kasturi, a member of Team Amber, said that the interactions with other teacher leaders exposed her to novel ideas, new instructional strategies, and different resources and, in turn, allowed her to reflect on her pedagogy, all of which "has helped [her] level up as an educator and a coach."

Keely, a member of Team Jasper from Oak Grove, credited her participation in the ILC project with helping her find her voice as a teacher leader and realizing that she had gained knowledge to be shared with others.

> Getting into the professional development model, [I realized] how much information I had gained from all my roles and all of my teaching positions, and all the different coaching roles, and ... how many teachers had not had the opportunity to experience those.... [I learned] how many questions people had that I was able to answer or give ideas or suggestions for. It was really exciting to me.

Her participation in the ILC project added to her sense of efficacy and to her insights about where she could have the greatest impact.

> Before I joined the ILC, I had no idea. I thought my personal passion was curriculum and instruction, which it is, but I didn't realize how much I wanted to be a part of the professional development within curriculum and instruction. So it narrowed my scope in terms of where I wanted to end up and what I wanted to do and where I really felt myself thriving.

Working as a team was a theme raised by several ILC members. They noted that they learned how to build on each other's strengths to perform needed tasks: One team member took responsibility for designing the arc of the workshop series, another team member communicated regularly with district representatives, and two other members planned and organized the workshops. Kasturi said, "Each of us has strengths, and we build on those strengths and we support each other with those strengths. It's a great experience, and I think I have the best team. Very supportive."

Kasturi also discovered a deeper sense of professional efficacy. She came to realize that she made a difference in advancing teaching practice in her district. In a statement that spoke to the essential message of the ILC project, she said:

> The biggest thing that I've learned was how you can perpetuate [learning to other teachers]. I did not even understand the model … of "educators educating educators." It's something that I did not know how that ever happens, but I think this was the biggest thing that I learned here: how we can just help other teachers to learn and how those teachers can take it and help other teachers to learn about things that we are teaching.

Student learning

Based on their analyses of student work samples, participants in the ILC-led workshops felt that the changes in their instructional practices positively influenced their students' learning. One middle school teacher described how his students "really start using the vocabulary and language. I've seen them switching their own mindsets in regard to how they might have viewed math before to seeing that there's a lot more to it than just getting the answer."

Students showed higher levels of motivation, yet they also differed in their abilities to adjust to the new performance expectations, in part depending on their previous levels of achievement. The teacher explained:

> I would say that for students that were already achieving at higher levels, it did give them a new way of looking at the math to be able to actually explain it and to teach it to others, which is really big in regards to getting them engaged with the actual content and being able to work with others within a collaborative team. For the students that were at [a] lower level: lots of struggling, lots of struggle.

Two positive student outcomes most commonly identified by teachers were increased levels of engagement and changes in students' approaches to learning. Teachers attributed these changes to the emphasis on using multiple strategies to solve problems as laid out in the CA CCSSM. One Alum Rock teacher we interviewed described how using number talks led to greater student engagement:

> Basically, we just put a circle on the board and wrote a number in the middle, or a phrase related to math. They just had to silently think about it on their own, and then they were able to share out what they thought, and we wrote it up on the board and we attached their name to it. So, they got really excited that their name got to be attached to their explanation.

She added that the flexibility of using different strategies gave students further opportunities to demonstrate what they understood and how:

> That also was a little more engaging for them, because even if they struggled, … they had that flexibility and [did] not feel like, "Oh, I'm not that strong in division or multiplication, but I have to do this [strategy]." That choice and flexibility was a big thing that I was trying to do a lot of last year.

Changing participant structures by incorporating pair work and groupwork contributed to increased student engagement, as described by a middle school teacher from Mount Pleasant district:

> What Moonlight University taught me was that our students really have to understand the concept behind the rule, behind any mathematical concept, like, what's the idea, what's the gist of it? And so we started explaining everything. And then my students are working in groups … [and] explaining different things to their classmates. It's like my classroom has changed dramatically from last year to this year, to be honest, because of all the extra math workshops that we've had.

The development of perseverance in tackling difficult problems is one of the goals of the new curriculum and the new standards. Increased engagement seemed to be related to increased level of perseverance, as perceived by one of the teachers from Mount Pleasant:

> Because we're preparing for the state test, we've done math all day. All day Friday, all day Monday, Tuesday, and even today. And on Tuesday, yesterday, the one student who is very negative about math, he's like, "Mrs. [teacher's name], I really, I like this better than having all the other subjects." Because he's like, "It's actually fun." And so for him to say that, I was very surprised. They really did enjoy it. They had fun in doing it.

Teachers we interviewed suggested that students responded positively to teachers who showed their own efforts in developing new skills and who modeled engagement and perseverance. For example, a teacher from Alum Rock said:

> I always have to learn something new, and I never use the same lesson plan, every year for 30 years. It encourages me to try other things, and to do what I tell my kids, "Making mistakes is an effort. At least you're trying, but then learning from your mistakes."

Her colleague described it as follows:

> I told them, "Just like you're in school and you're learning, I'm taking these classes after school to learn things, and now I have to try them with you." So I was very honest with them about what I was doing and how this is helping all of us in our learning. They were very willing to do all of this for me, and it was extra, aside from our regular curriculum, and they couldn't wait for me to go back [to the PDWs] and have to then do something new and different with them. They just loved it.

The teachers and the students were clearly all in this together. The openness to learning and an exceptional level of trust created a mutually supportive and motivating environment for students and teachers.

Teacher Learning Continued

In a recent conversation, Bernadette, an ILC leader and member of both Team Jasper and Team Amber, described the continuing work of Team Jasper in supporting two mathematics symposia, the math collaboratives, and Moonlight University. During the 2018–19 academic year, teachers of grades 3–5 were invited to participate in the math symposia, previously designed for middle school and high school math teachers only. Bernadette noted that there are many benefits to having grade 3–12 teachers attend the math symposia. The number of collaboratives was reduced by combining two or three high schools and their feeder middle schools so that they could focus on the content of the math standards and enhance cross-school interactions. The Moonlight University series continues in Mount Pleasant district. ILC members are increasingly drawing on the principles of improvement science[77] to focus on specific problems of practice and to engage with district and site administrators. Bernadette indicated that, by broadening the number of those with a stake in continuous improvement focused on student learning, the ILC can be more "strategic and intentional" in addressing "the unfinished learning of the most needy students of East Side."

Team Amber also built upon its earlier successes by developing a new workshop series on "mathematical routines for reasoning."[78] Because teachers find it logistically challenging to attend all six sessions of the series, the team framed the new series as three sets of paired workshops, each focusing on one of three avenues of mathematical thinking. This approach balances teacher time constraints with maintaining the multiple workshop format of the ILC professional learning approach.

ILC members also led sessions at the CTA's Good Teaching and New Teacher conferences. Bernadette felt that her work as an ILC leader has enabled her to consider issues facing educators through multiple lenses—as a teacher, an administrator, and a county representative.

Key Takeaways

The ILC teams in the ESA accomplished a core goal of the alliance: to contribute to teacher learning for the implementation of the CA CCSSM. Participants in the ILC workshops planned lessons collaboratively, used and practiced new pedagogical moves, reported on their implementation in the classroom, raised questions, offered ideas, and benefited from collegial support.

The two ESA ILC teams achieved shared goals in different ways by identifying and responding to the immediate learning needs of the students and teachers in their home districts. ILC teacher leaders demonstrated the value of understanding the local context and operating within its constraints and affordance. In addition to the large-scale events organized by the ESA, the teams organized workshops and sessions that further supported the teachers' understanding of the Standards of Mathematical Practice.

ILC teacher leaders' sense of efficacy was enhanced by recognition of their professional contributions to teacher learning by colleagues, district leaders, and the teachers association. ILC team members reported increased confidence in their professional know-how and leadership qualities. Some ILC teacher leaders took on added responsibilities or assumed positions that allowed them to extend more support to their colleagues, who recognized their efforts and the quality of their work.

The necessary institutional arrangements and the vitality of the team members offered hope for the sustainability of future activities. Incorporating the resources of the County Office of Education was indispensable to the teams' success. The steady backing of the local CTA chapters raised the visibility of the work and the ILC members' confidence.

Teacher-led professional development is trustworthy and appreciated. The essence and the professional value of the ILC project are captured by the words of a participating teacher:

> Teachers like learning with other teachers and from other teachers because they know we are in the classroom. The credibility goes down the further out of the classroom [someone is]. I think for teachers that was a selling point: "Oh, these are our teachers, OK; they're in the classroom with kids just like I am." This is my third year starting … with the ILC.

Chapter IV: The Instructional Leadership Corps in Conejo Valley USD: Building Science Capacity

In 2013, the California Board of Education adopted the Next Generation Science Standards (NGSS). Expected to take effect fully during the 2018–19 school year, its introduction followed on the heels of the adoption and early implementation of the Common Core State Standards (CCSS). Although teachers were somewhat more prepared for the profound changes required by the NGSS pedagogy and assessment owing to their early experiences with the CCSS, full implementation of the new curricular framework still posed considerable challenges. It had to be accomplished through a deliberate process that required the full attention of the teachers, administrators, students, and families.

Addressing these challenges takes considerable time, effort, and financial and human resources. To articulate learning goals, teachers needed to unpack the standards and understand the accompanying assessments and the expectations for what students should know and be able to do. To initiate and support student learning through teacher–student and peer interactions, teachers needed to broaden their content knowledge and expand their pedagogical content knowledge. Engaging in sustained professional learning in the company of colleagues has shown much promise in the field. Many teachers yearn to learn with and from each other.

This case study profiles two ILC teams from Conejo Valley Unified School District (CVUSD) who developed projects in which teachers conducted seminars and undertook coaching for colleagues to learn more deeply about how to implement the NGSS. We describe how the teams, composed mainly of middle school and high school teachers, identified professional learning needs in teaching science and delivered workshops to address these. We look at how the teams developed institutional relationships with district and county offices to leverage resources and foster sustainability, and we describe the implications for teacher learning and leadership development.

The Next Generation Science Standards

Three distinct yet closely connected dimensions for learning science are included in the NGSS: crosscutting concepts, science and engineering practices, and disciplinary core ideas. The crosscutting concepts are patterns; cause and effect; scale, proportion, and quantity; systems and system models; energy and matter; structure and function; and stability and change.[79] According to the NGSS document, these concepts help students organize and connect their knowledge from different domains into a coherent, scientifically based view of the world. Guided by crosscutting concepts as well as disciplinary core ideas, students explore connections across the four domains of science (physical science, life science, earth and space science, and engineering design). They engage in scientific practices as they investigate the natural world and design and build systems. The science and engineering practices emphasize asking questions and defining problems, developing and using models, planning and carrying out investigations, analyzing and interpreting data, using mathematics and computational thinking, constructing explanations and designing solutions, engaging in argument from evidence, and evaluating and communicating information. The focus on these practices requires significant changes in how students learn and in how teachers teach and assess their students' learning.

With the adoption and implementation of the NGSS in districts and schools, students, teachers, and administrators faced new tasks. First, many teachers had not had opportunities to develop the necessary subject matter expertise to design, evaluate, or successfully adapt high-quality curricular materials. Curricular resources and a solid understanding of central concepts and big ideas are indispensable for the development of deep disciplinary content knowledge in the four science domains.

Second, planning for teaching and organizing the classroom for the development of science and engineering practices requires not only flexible disciplinary content knowledge but also a redefinition of the traditional teacher role and a restructuring of the classroom to support productive and equitable student interactions.

Third, science, like social studies, was a neglected subject in many elementary schools and some middle schools during the No Child Left Behind period. Because the California NGSS are organized by grade level, educators were concerned with students' under-preparation in science content as they reached the upper grades. Vertical alignment around the progression of crosscutting concepts from k to 12 and the pedagogical tools for the development of science and engineering practices have been frequent topics of conversation among concerned teachers.

About Conejo Valley Unified School District

Conejo Valley is a region between Ventura County and Los Angeles County in Southern California. It was the homeland of the Chumash people, who lived there over 10,000 years ago. In the 1800s, the area was part of Alta California, a Spanish polity in North America. The Spanish colonists named it Conejo Valley, or Valley of Rabbits. Until the 1950s, the region was mainly agricultural. In the 1920s, many Hollywood producers were attracted to the region, and some of the first well-known films were made in the area. Starting in the 1960s, many high-tech firms moved to Newbury Park and surrounding towns. Today, the local economy is based on the biotechnology, electronics, automotive, aerospace, telecommunications, health care, and finance industries. Students who attend CVUSD come from the communities of Thousand Oaks, Newbury Park, and Westlake Village, with a combined population of approximately 175,000. Most of the population in Conejo Valley is White, and, with a median household income above $100,000, it is among the wealthiest communities in the United States.[80]

CVUSD is one of 20 districts served by the Ventura County Office of Education. The district itself is medium size, with approximately 19,000 students and 860 teachers in 16 elementary, one k–8, four middle, three comprehensive high, and two alternative high schools.[81] The district also offers preschool, early child care, transitional kindergarten, and adult education. Its annual expenditures are over $180 million.

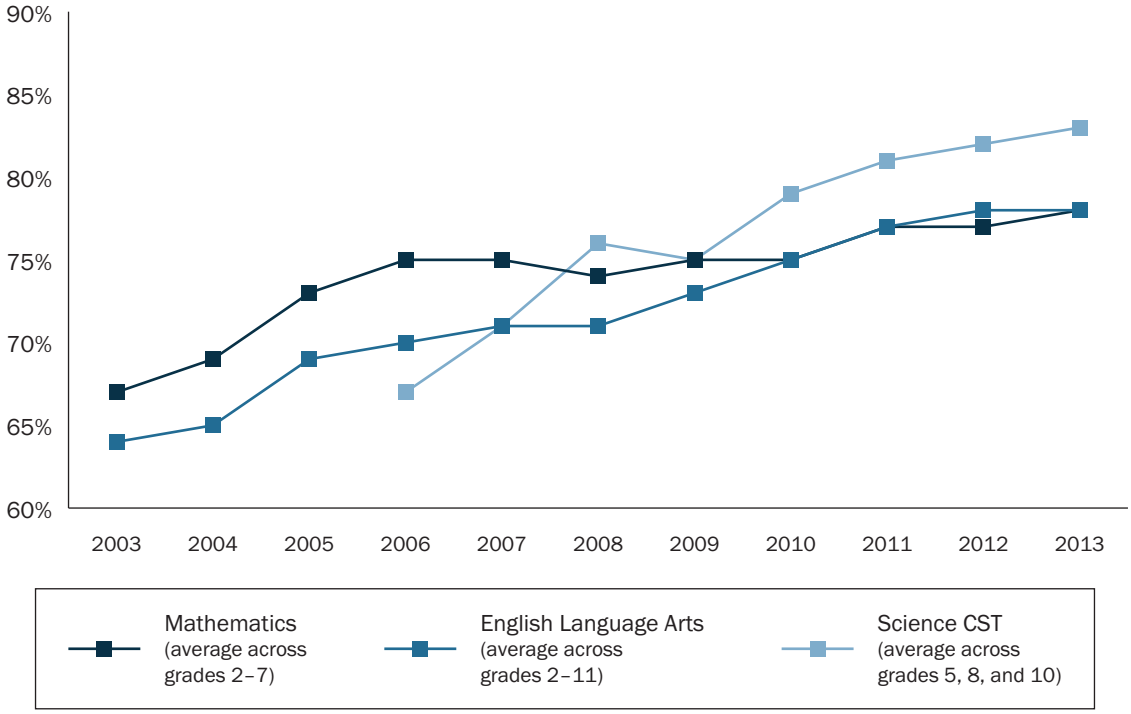
The district's student population is somewhat different from the demographics of the community as a whole. According to district documents, slightly more than half of the student population is White. Twenty-six percent of students identify as Hispanic or Latino/a, and close to 10% are of Asian heritage. Small percentages of students are multiracial, African American, Filipino, or Native American. At the time of data collection, about 10% of students were classified as ELs, about half that of the state's average. About 22% were Redesignated Fluent English Proficient (RFEP).

Spanish is spoken by most students who speak a language other than English in their homes. The population of students eligible for free or reduced-price meals was 21%, close to one third of the state's average (58.1%).

Conejo Valley is recognized as a high-achieving school district. Graduation rates in the district have been steadily rising, with the 4-year cohort graduation rate exceeding state averages and moving from 94.8% to 97.4% from 2011 to 2015; the 4-year dropout rate fell during the same period, to less than 2%.[82]

Overall student achievement has also risen fairly steadily over time. As measured by California's Standardized Testing and Reporting (STAR) assessments, which were conducted until 2013, 78% of the students scored at the proficient or advanced level in ELA (grades 2–11) and in mathematics (grades 2–7). Science scores also rose over the period since 2006, with 77% of 5th-grade students scoring at the proficient or advanced level in 2013, 89% of students in 8th grade, and 82% in 10th grade in the same year. (See Figure 9.)

Figure 9
Conejo Valley USD Proportion of Students Scoring at Proficient or Advanced Level on California Standardized Tests (2003–13)

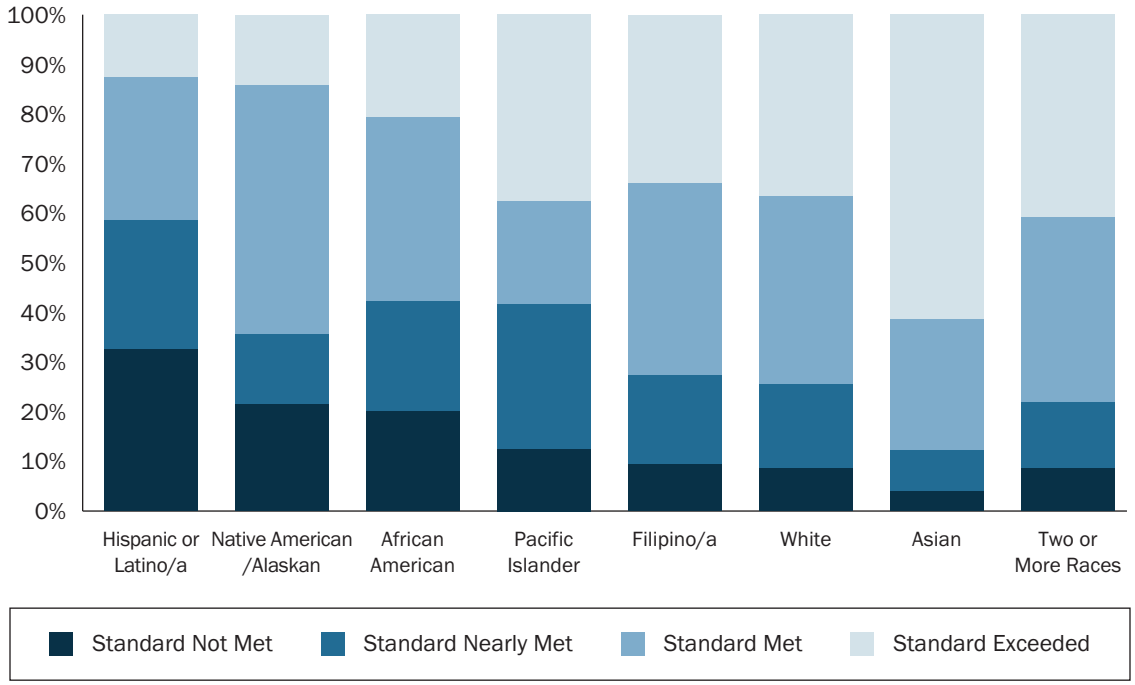


Source: California Department of Education. (n.d.). Standardized Testing and Reporting (STAR) results. https://star.cde.ca.gov.

In 2014, the STAR assessment system was replaced with the multifaceted California Assessment of Student Performance and Progress (CAASPP) system, which more closely assesses critical thinking and problem-solving skills. Conejo Valley students consistently performed above state averages on these assessments. In 2017, approximately 67% of students in the district met or exceeded state standards in ELA, and 59% met or exceeded state standards in mathematics. This compares with state averages of 49% and 38%, respectively.

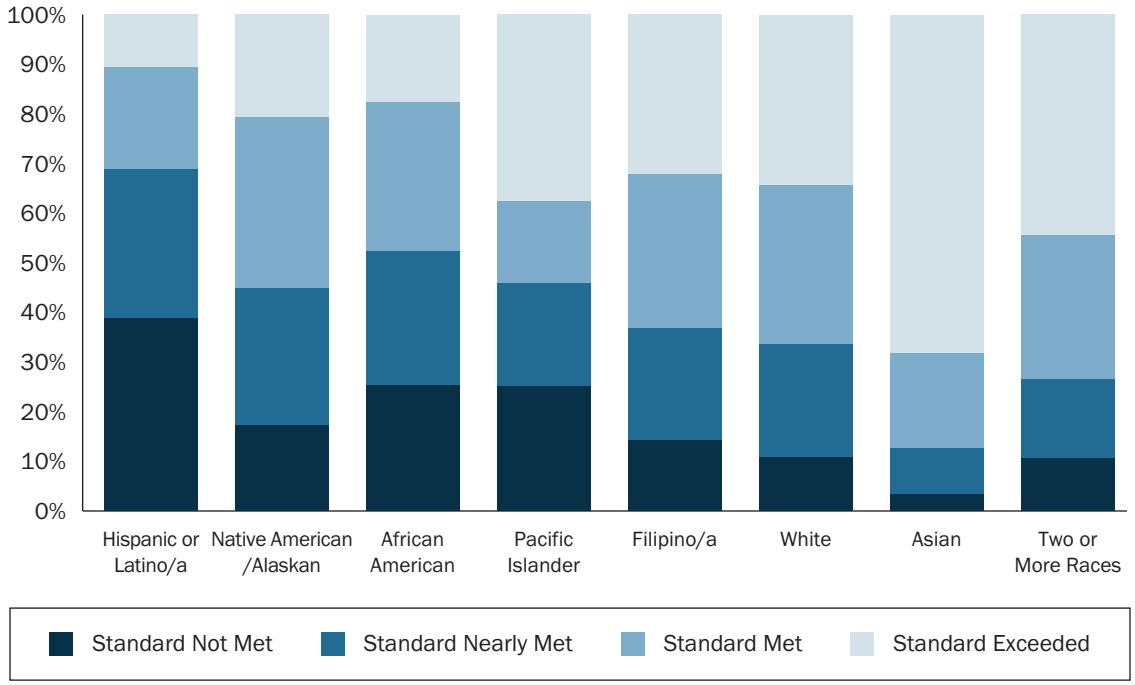
Yet this overall high achievement masks some differences among student scores by ethnicity, as shown in Figures 10 and 11. Close to 90% of Asian students and more than 70% of White students met or exceeded the standard in ELA, each substantially exceeding state averages for similar students. Approximately 40% of Hispanic or Latino/a students met or exceeded the standard in ELA, slightly above the state average for similar students.

Figure 10
CAASPP Scores in English Language Arts by Ethnicity, All Grades, 2017



Source: California Department of Education. (n.d.). CAASPP test results for English language arts/literacy and mathematics. http://caaspp.cde.ca.gov/sb2017/default.

Figure 11
CAASPP Scores in Mathematics by Ethnicity, All Grades, 2017



Source: California Department of Education. (n.d.). CAASPP test results for English language arts/literacy and mathematics. http://caaspp.cde.ca.gov/sb2017/default.

Mathematics scores by ethnicity reflect a similar trend. In the district, 87% of Asian students and close to 66% of White students met or exceeded the standard. In comparison, 31% of Latino/a students met or exceeded the standard. Both the White and the Latino/a student populations significantly exceeded the respective state averages in mathematics (53% of White students and 25% of Latino/a students).

The difference is more visible in students from economically disadvantaged families. In both ELA and mathematics on the state's CAASPP assessment, students who identified as Asian or White from economically disadvantaged backgrounds achieved at rates substantially greater than the state average for similar students. For Latino/a students from economically disadvantaged backgrounds in the district, achievement levels were below state averages for similar students. Thus, despite overall strong performance on CAASPP assessments, learning needs for students and teachers were evident as the district moved ahead with the implementation of the CCSS and NGSS.

District Responses to CCSS and NGSS

The two teams of ILC teacher leaders in Conejo Valley began with efforts to raise teacher awareness of the CCSS and quickly sharpened their focus toward the NGSS and the associated instructional shifts, particularly at the elementary and middle school levels. The district's goal to align professional development with the CCSS and the NGSS informed the ILC's own efforts. The district and ILC teams perceived gaps and ongoing learning needs among their teaching colleagues. Teacher leaders recognized

opportunities to emphasize vertical alignment in teaching science as well as to engage with teachers and incentivize colleagues to participate in professional learning workshops. District policy changes also created an environment in which teacher-led professional learning could function and flourish.

Administrators and teachers in CVUSD, a well-resourced district, prepared attentively for the adoption of the CCSS. For teachers, the change meant moving away from covering a large number of topics quickly and instead moving toward greater depth in central disciplinary content. Teaching to the new standards also meant an adjustment for students. Courtney Stockton, a science teacher and ILC member, voiced the thoughts of many teachers when reflecting upon the shift from recollecting facts to answer standardized test questions to the strong conceptual understanding sought through CCSS and NGSS implementation:

> Well, it's hard for the kids, too … because you're like, "OK, I want you to think about this," and they're like, "Think? No, just give me the answer. Tell me what to write down." "Well no, I'm not going to tell you what to write down.… I want you to think about [it] and try to make a connection."

This sentiment was echoed by a district official who described the change to the new standards as requiring the more active involvement of students; a deepening of content knowledge, from simple memorization to more active engagement; and the ability to transfer knowledge to novel situations. She recognized that disciplinary rigor becomes deeper as students are allowed to explore, use their problem-solving and critical thinking skills, and come up with their own conclusions. She saw these changes as shifts in how science is taught in the district.

Opportunity for Teacher-Led Professional Learning in Conejo Valley

Unlike many districts, CVUSD had a precedent for teacher-led professional learning, and in the early stages of CCSS implementation the district benefited from an influx of state funds designated to support these efforts. DeDe Dryer, a Teacher on Special Assignment (ToSA) and ILC member, noted that with the support of those funds, the district had offered teachers approximately 350 workshops in a single year. Concurrently, a district-run program had selected 20 teacher leaders to become instructional coaches. They were paid a small stipend for delivering PDWs to colleagues. These instructional coaches had a significant degree of latitude in the content delivered as long as they ran a minimum of six workshops for the teachers. According to some of the teachers with whom we spoke, these workshops were insufficiently attended, and the program was suspended.

In moving forward with the implementation of the CCSS and, later, the NGSS, the district made a strategic decision to phase in the newly adopted standards and assessments sequentially, starting with elementary, then middle, and then up to high school levels. The idea of vertical teaming was explored by some high school science teachers who sought to work with elementary school teachers. The ILC thus arrived in CVUSD at an opportune time. Professional development activities in the district seemed to be forerunners to the ILC's "teachers teaching teachers" model. Some ILC members had been part of the CTA Institute for Teaching, a teacher-led and evidence-based school improvement effort,[83] and applied enthusiastically to the new project, recognizing its potential and value. District and school administrators supported the ILC team members' initiative to provide professional learning, noting that members had already established significant professional relationships with the County Office of Education as well.

District officials with whom we spoke described the teacher-led aspect of the ILC model as complementary to the district's stance on professional learning. However, a senior administrator noted that a key challenge to the district's earlier approach to professional learning was that much of it had been in the form of single workshops:

> Coming to this district, I was actually saddened to see that professional development is not something that is seen as an iterative and ongoing process. Rather, it is a few hours dedicated here and there for a "one-and-done" kind of process.

In recent years, the district policy shifted to provide greater flexibility to teachers in the professional development they choose to undertake. Teachers are allocated 12 hours of professional development annually as part of their teaching contracts. Rather than cramming these hours into 2 days ahead of the school year, teachers can spread the hours across the school year, and half of these hours can be selected by the teachers. The same district official noted that this approach presented both advantages and challenges:

> They're able to tailor and target things to meet their interests, but sometimes those interests that they have are not necessarily focused on where they need to develop their skills as a teacher and/or it can create inconsistency in the district in terms of which teachers get access to which types of programs.

In addition to district-led efforts to implement the CCSS, the Ventura County Office of Education played a leading role in the area of science. The county office, as part of a statewide rollout of the standards, created an NGSS leadership team, composed of teachers from across the 19 districts within the county. Many district administrators perceived the county-led professional development sessions as most valuable to their teachers.

The Conejo Valley Instructional Leadership Corps

The ILC project in Conejo Valley began with two experienced teachers from the district, Ashley Cooper and Courtney Stockton, who joined the ILC in 2014, the project's first year. They had both participated in the Institute for Teaching. The team expanded during the second and third years as five highly experienced teachers joined the ILC: three science teacher leaders; a ToSA and former vice principal; and a teacher from an elementary magnet school and member of the county's NGSS leadership team. By the third year of the project, two teams had formed and conducted their activities in parallel, each focused on professional development in science and NGSS. We named these teams Team Oak and Team Redwood.

Team Oak:

- Courtney Stockton, high school science and special education teacher and member of CTA's Institute for Teaching;
- DeDe Dryer, ToSA and former high school vice principal; and
- Kathryn Peoples, elementary school science teacher and member of Ventura County's NGSS leadership team.

Team Redwood:

- Ashley Cooper, high school science teacher and member of CTA's Institute for Teaching;
- Rhonda Frohn, high school science teacher and school department chair;

- Jennifer Mutch, middle school science teacher and online teacher professional learning blogger; and
- Julie Sutton, middle school science teacher.

We asked Ashley, a passionate veteran high school science teacher and one of the founding members of the team, why the ILC in Conejo Valley focused on science and the NGSS. She explained that the rationale for their work was to inspire young students early in their education careers with vivid science experiences that could serve as the foundation for later learning:

> I think science for so long has not been discussed.... Common Core was the latest and greatest for a good 5 or 6 years.... We know good teaching is good teaching. And many of us are implementing NGSS and used these strategies before. But why science, why now? [Why] in elementary? Because it gets kids excited. And if kids can see and do science, then [teachers] are more willing to read lessons. They are more willing to look at, "Wow, I just saw that reaction. I just did something, now I can read an article about it. I can maybe apply a math concept to it." So, to me, science is the glue that holds it together.... And our elementary students still have that wonder. So how can you capitalize on the wonder of learning through science and get them excited about other areas that they may struggle in?

Other educators we interviewed mentioned that because the elementary grades focus on developing reading, writing, and mathematics competencies, elementary school teachers were more likely to participate in professional development meetings in those areas rather than in those dedicated to science. One ILC member noted that elementary school teachers tend to be less confident, and some even felt "afraid" and "really had no idea what NGSS was." Other educators we interviewed noted that elementary school teachers were less likely than high school teachers to have majored in a science discipline in university. Thus, it was assumed that elementary school teachers needed more foundational work to get familiar with the NGSS and engage with science. As a district administrator noted:

> At the most foundational level, [NGSS PD at the elementary level] came from teachers saying, "Wait a minute. I only really teach reading and math, and yeah, I'll throw some social studies in there, but if you want me to teach [science], then I'm going to need a lot of help."

The ILC responded to an expressed, grassroots-driven impetus for professional development in science. An elementary school teacher whose class we visited described how she and her colleagues tended to view their primary responsibilities as developing foundational skills in reading and mathematics, with science as a secondary consideration:

> Let's be honest, elementary school [teachers] a lot of times, especially k, 1, 2, are like, "We've got reading and math. Those are our things and if we can get them to read and write and count, we've done our part."... I'm not saying we didn't teach science, but it was sometimes a little hit and miss, you know what I mean? And [when busy], sometimes it would be the first thing that would go out the window.

A second rationale for focusing on science in PDWs was the expressed need for professional learning about the so-called crosscutting concepts and the science and engineering practices that were key elements of the NGSS.

This need was not limited to elementary school teachers. For example, one teacher opined that although high school science teachers likely had more solid discipline-specific backgrounds, the specificity of their content expertise might challenge the way they interpreted the NGSS. Thus, they too could benefit from the professional learning opportunities.

Recognizing this range of teacher learning needs, ILC members decided to design professional learning opportunities in science that would allow multiple entry points, depending on the teachers' previous experiences and on their perceived familiarity with the standards. DeDe elaborated:

> We felt with NGSS that there were people at all stages of the process. So, there are people who are elementary school teachers, who teach every subject, and science maybe wasn't in any of their backgrounds and they're like, "No, thank you." And then on the other end of the spectrum, you've got high school teachers who majored in science and maybe worked as scientists, and they are also saying, "No, thank you," for another reason. They're saying it because, "Wait, wait, wait, I already know how to teach chemistry. I don't need to learn anything different. I don't want to learn anything different." So, you've got those two extremes, and then you've got everybody in between.

Many upper-grade teachers perceived the adoption of the NGSS as a not-to-be-missed opportunity to strengthen and deepen science teaching in the elementary schools. The progression of concept development across grade levels and the early introduction of science and engineering practices called for explicit and well-founded vertical alignment in the district curriculum and in the teachers' pedagogical approaches. Ashley characterized it as follows:

> It's like we're building a shiny, pretty skyscraper on a foundation of quicksand. Because if we don't help those elementary teachers, we're losing those really important years where there is the wonder and the excitement of learning. So if we can get students excited [in those early years], then that skyscraper's going to be even better once we build it.

Kathryn, another ILC team member and an elementary school teacher, echoed the will and desire to reach out to the elementary school teachers because she, like the other members, recognized the need and was passionate about the work.

A third rationale for the ILC's focus on science was that, in a community and district in which science and technology companies are among the largest employers, science as a school subject is perceived as particularly consequential. For example, in 2009 the district created a science-focused k–5 magnet school called EARTHS (Environmental Academy of Research Technology and Earth Sciences) after a district committee explored different innovations and opportunities and a community survey indicated that science and technology attracted the greatest interest. Another k–5 school, Ladera STARS Academy, was the newest in the district and featured a STEAM (science, technology, engineering, arts, and math) emphasis. This school had an active makerspace and discovery lab and featured integrated curriculum across content areas based on the NGSS.

One STARS Academy teacher who participated in a PDW that Kathryn led noted how beneficial it was for her:

> We are becoming a magnet school next year, so we're introducing STEAM into our curriculum. Rewriting curriculum. So it was really beneficial to have somebody who has done that. We talked a lot about books, and how she did it during language arts time, and integrated science in the language arts. We are working on arts and engineering for STEAM. We are looking at it in a different way because we're really looking at what are the NGS Standards, how we can teach those in language arts, how we can teach those in science, and where does social studies get pulled in.

For this teacher, how to put it all together was the big question:

> Right after school started, we had a story about a cat. So we designed a bed for that cat, but then we [also] wrote a letter to that character telling them why our bed was better than what they had before, and that was something that I got from the institute. That [recognition of], "Oh, I can do this. It's OK to pull that writing into it."

Competition among the three comprehensive high schools in the district was yet another reason for the science focus in professional learning. The high schools sought to distinguish themselves to attract students from the feeder middle schools and even elementary schools. An administrator from one of the high schools shared his perspective with us:

> This is a unique school district. We have three high schools that are all high performing and very competitive. We're kind of in a science-rich area here … so we have parents who are looking for their students to be in a science-rich environment.

Given the community's interests, specialized science programs in upper high school classes were one way in which high schools could differentiate themselves. This administrator described a science program at another high school in the district as one in which "students do dissection on cadavers, human cadavers, and so that seems to always be a magnet for students to go there. They're science rich." He recognized that although his high school had a strong science department, they did not yet have a signature program. The school "felt the need to develop a signature program, something that would make us stand out, and so we built this scientific research class with the idea that students could go out and compete at the local science fair." Students who participated in the program found strong, supportive networks through their parents, scientists from nearby companies, and researchers and scholars from University of California, Los Angeles. The class was accepted by the College Board Capstone Program as an Advanced Placement research class, which brought the school recognition. As the administrator noted, "The class has really supported … our efforts in transitioning to an NGSS model because students are doing real science."

Through this innovative science class, the high school also made connections to two of its feeder middle schools, as well as a middle school outside of its area. The same administrator thought that "in supporting those students in completing science fair programs that obviously support the NGSS from the standpoint of kids doing inquiry-based, real hands-on science," the teachers from his school were making an important contribution.

The ILC members were thus well placed to respond to the learning needs of the teachers and offer professional development in science. Several ILC members also participated in county-led meetings designed to roll out the implementation of NGSS to districts and schools. Teams of science teachers from each district and from different grade levels (Conejo Valley teachers among them) attended the rollout meetings organized by the County Office of Education. They returned to their home districts with the information that contributed to the development of local plans. According to an ILC member, the Conejo Valley teachers met infrequently before the advent of the ILC project. After that, they developed a sense of urgency to plan ways to improve practice as the NGSS implementation date approached.

Learning From Early Efforts: ILC 2014–15

The first year of the ILC project (2014–15), Ashley and Courtney, the first members of the ILC team, organized a workshop titled "Shifting Gears to the Common Core." Using some examples of relatively short classroom experiments (using water and food coloring), the presenters introduced both the CCSS and NGSS and their increased emphasis on skills. They contrasted these standards with the previous set of state standards that largely emphasized content. A discussion of Bloom's taxonomy, Webb's depth of knowledge (DoK) levels,[84] and cognitive rigor matrices generated ideas about how teachers can deepen their instruction to push student thinking further.

In designing the workshop, Ashley and Courtney followed the ILC's guidelines for effective professional development. First, participants engaged in a science activity and worked with colleagues to develop a lesson plan. Next, participants reviewed each other's lesson plans and identified the DoK levels addressed in them. Teachers offered feedback to their colleagues as well as suggestions on additional strategies for deepening and varying levels of complexity in the content of the lessons. This feedback, as well as that from the workshop leaders, was aligned with a strength-based approach, asking teachers to identify and build upon work that had been successful and to push that work further.

Both ILC members were concerned about two issues: the need to develop the workshop very quickly and the need to achieve the ILC's benchmark number of attendees. To achieve broad reach of impact, the ILC had set the goal of 75 attendees for the first year and 150 attendees for the second year. Ashley and Courtney presented the same workshop in several settings separately. Ashley's workshops occurred in three sessions with about a dozen attendees each. At first, Courtney folded these NGSS-focused workshops into his existing work as an instructional coach and presented workshops at a union-organized professional development day. Together, Ashley and Courtney also delivered a version of the workshop to about 75 teachers at a county-led Beginning Teacher Support and Assessment (BTSA) induction event. This workshop included a science experiment that teachers could then replicate in their classrooms.

Although the team met the expected number of participants, they felt they had been unable to recruit and target participants deliberately and according to need. They also felt that the emphasis on number of attendees meant that the workshops lacked a strategic focus and provided little or no opportunity for sustained follow-up. Because the district administrators and the teachers union had agreed that 6 of the 12 hours of professional development could be at the teachers' discretion, teachers had the flexibility to attend workshops of their interest. The ILC workshops offered teachers opportunities to fulfill their professional development hours and engage with the NGSS, but the ILC team members felt they did not achieve what they had envisioned. Their workshops, they thought,

could be subject to the same criticism that they and their colleagues had voiced regarding much of the traditional professional development: that they neither addressed teachers' specific learning needs nor led to meaningful changes in instructional practice because of lack of feedback and coaching.

After the inaugural 2014 year, Ashley took a leave of absence from the ILC project. Courtney recruited new ILC members and continued their efforts to provide professional development opportunities for teachers both in the district and at statewide conferences. As Courtney's team developed and Ashley later returned to the project with additional colleagues, these two Conejo Valley ILC teams set about adapting their approaches to address the challenges experienced with their early efforts.

Responding to Teacher Needs: ILC 2015–17

Team Oak: A differentiated approach

During the 2015–16 academic year, Courtney invited DeDe and Kathryn, two veteran teachers in the district, to work with him. Together they formed what we called Team Oak. This team created a tiered approach to NGSS and science instruction, recognizing the variability in experience and comfort levels of teachers in the district.

Given their roles and responsibilities in the district and beyond, the team members were particularly well situated to plan and carry out their activities. Courtney, a member of the union board, kept the records and data about the team's activities and advised his colleagues regarding possible financial and other contributions supported by the union. DeDe was instrumental in scheduling, securing financial and organizational resources, advocating for the work of the team at the district level, and overseeing much of the logistics related to the workshops. Given her experience and expertise in teaching and providing professional development for ELA teachers, her contributions in integrating the different areas at the elementary level were particularly beneficial. As an elementary school teacher with special affinity for teaching science, Kathryn's contributions were central to the team's activities. Her broad involvement with the rollout of NGSS at the county and district levels helped the team align its professional learning offerings with these broader initiatives.

Early on, the team recognized the variability in teachers' familiarity and experience with NGSS. The team was also ready to introduce and support shifts in curriculum and instruction required by the implementation of the new standards. By 2016–17, the third year of the ILC project, the team had developed a three-level approach to professional development, with each level targeted at teachers based on their familiarity with the NGSS—from those yet to engage with the standards to those already incorporating NGSS approaches such as the crosscutting concepts and science and engineering practices. The team later organized a summer institute to provide opportunities for teachers to learn more about active, inquiry-centered approaches to teaching and learning science. One of the team members talked about her frustration with past professional development workshops and described the team's impetus to develop a different approach:

> My personal problem with PD has always been that it's not differentiated. So every time I attended training, I felt like I maybe got a 5-minute nugget out of a day, and that's frustrating as a teacher. You want to meet people where they are, and move them forward where they need to be, just like the kids in our classroom. We're always telling our teachers to differentiate, and they're not differentiating for us. I saw the ILC as an opportunity to differentiate.

The team's three-level model offered varied opportunities for teachers to deepen their knowledge and boost their confidence as they progressed from awareness of the standards to observations of demonstration lessons to participation and collaboration in expert groups. A culminating activity was when teachers could participate in a summer institute in which they engaged in hands-on science activities and received science resource kits.

Level 1: NGSS awareness

The team's first offering was a webinar that was open to all district teachers for professional development credit but that mainly targeted teachers who needed to familiarize themselves with the new standards. Kathryn created the webinar in collaboration with all the members of the district's science committee. It consisted of a PowerPoint presentation accompanied by a voiceover introducing the basics of NGSS, explaining how to read the standards, and outlining the associated instructional shifts. Teachers could click on a link after watching the presentation and respond to a short survey to demonstrate completion. Teachers who completed this process received a certificate and district credit of half an hour of their annual professional development requirement. About 50 teachers watched the webinar. Due to the collaborative process by which it had been designed, the webinar clearly reflected the district's priorities regarding the implementation of the NGSS.

Level 2: Pedagogical shifts

The team designed Level 2 for teachers who could verify completion of Level 1 by either having watched the webinar or having participated in a district rollout event or conference. Level 2 consisted of three workshops offered after school to k–12 teachers. Each workshop was attended by 10–20 teachers, mainly from upper elementary and middle schools. Opening these workshops to elementary, middle school, and high school teachers was an intentional move designed to inspire multigrade collaboration and to give teachers perspective on learning progressions of disciplinary content and practice across grade levels. The focus of these workshops was on scientific modeling and the use of interactive science notebooks. Developing, using, and revising models to explain, explore, and predict phenomena is one of the science and engineering practices featured in the NGSS. During the workshops, participants had multiple opportunities to participate in hands-on science experiments and to practice scientific modeling.

Interactive science notebooks are practical and widely used tools. Using their interactive science notebooks, students write down information given by the teacher or gathered from other sources on the right side of a spiral notebook. On the left side, students document the ways in which they make sense of the information gathered on the right side. By periodically reviewing the students' notebooks and providing feedback, teachers have opportunities to assess individual progress as well as to communicate with the students' parents or guardians.

Kathryn described the workshop content as follows:

> We introduce the idea of scientific modeling. The teachers have to read various definitions of what scientific modeling is, then pick things that resonate with them, and they create their own definition of what scientific modeling is. From there we do a mini-experiment where they have to create sound using a rubber band and a cup, and I pose a focus question actually from 1st grade about what causes sound. So, I lead them into how to create a scientific model to share their ideas.

> First, they work individually, then they collaborate and work in groups, and then from the groupwork, they create a big poster that's a group model of how their cup made sound. They then trade posters with another group, offer feedback, communicate with that group, and tell them changes and adjustments they'd make or things that they really like. Then they go back to their original design and modify and redesign [it].

She continued to describe how the content and the format of these workshops facilitated collaboration and understanding of pedagogical strategies used across grade levels.

> We chose [that workshop structure] because we thought [it's] a tested way to demonstrate knowledge and make authentic science.… You can [also] use that strategy whether you're working with kindergarteners, or 11th or 12th graders. We wanted something where it was a new experience where the k–12 teachers could work together and not be separated into their grade-level groups, so we can learn from each other. So here I am representing my 1st-, 2nd-grade concept of what creates sound, but then I'm also getting input from maybe a middle school teacher who teaches in a very different way, and it opens that door for cross-grade-level collaboration. And we've had amazing feedback from that. Those people have said they went back to their rooms and tried it, and they loved it.

As part of the workshop, ILC members also offered to model lessons and observe teachers' classes free of charge. Observing classrooms and demonstration lessons of expert teachers is a high-leverage professional development practice and can contribute to deepening and strengthening skilled practice. However, such collegial observations during regular school hours are costly in two ways: First, the observer needs to leave his or her classroom (which many teachers are hesitant to do), and second, the school will need to hire a substitute teacher to cover the classes.

Although this opportunity was open to all the workshop participants, only two teachers took advantage of it. Their principals were so excited that the teachers were asking to observe another expert teacher teaching science that the school covered expenses for the substitutes. Those teachers indeed benefited, as DeDe described:

> Two [3rd-grade] teachers … were released from their sites … [to watch] a 3rd-grade teacher … experienced with NGSS implementation, and then [they] talk[ed] to her afterwards. They were so excited that they came to the district and asked us if they could get more materials and whatnot.… We'd hoped that there would be more people who took advantage of that, and hopefully next year there will be. [For] the two who did take advantage of it, there was a huge growth in their understanding, their desire, and everything to do more work with NGSS.

Team Oak presented the same Level 2 workshop to elementary principals at a district principals' meeting to involve school leaders in the same professional learning as their staff. The district office received positive feedback from the teachers who had observed their colleagues' classrooms and from the principals who participated. ILC members regarded the positive experience as a contributing factor in the district's support for planned summer institutes and in the funding granted for additional science kits for elementary schools.

Level 3: Expert collaboration

Like Level 2 workshops, the ILC held Level 3 workshops after school three times a year that were open to teachers of all grade levels, with approximately 10–15 teachers attending each session. Unlike Level 2 workshops, which were intended for teachers who were new to NGSS, Level 3 workshops were designed for teachers who were already implementing NGSS and wanted the opportunity to share and collaborate with other teachers. As Kathryn said, "They're on their journey, they've got some ideas, they want to bounce them around, share successes and troubles. It was just a facilitated group of experts."

Teachers attending Level 3 workshops were required to prepare before each session. Because the purpose was to share teaching strategies, resources, and lesson plans with others, attendees had to bring relevant artifacts for discussion, which were then collated and placed into a shared Google Drive folder, accessible to those in the group. Teachers participating in the Level 3 workshops received 2 hours of credit toward their professional development hours.

Summer institutes: 2017 and beyond

Participants' responses to the workshops, and particularly the enthusiasm of the two teachers who had the opportunity to observe a colleague, generated interest from the district's administration along with recognition that the ILC workshops had the potential to contribute to teachers' professional learning. ILC members also realized that the participants, particularly the elementary school teachers, needed additional guidance and support. With financial support from the district, and responding to the teachers' expressed interests, the ILC team decided to offer a 2-day summer institute in 2017, the first in a series of three such institutes.

The 2017 summer institute was held at Kathryn's school, the EARTHS science magnet school. Kathryn and DeDe were the main actors in organizing the institute, planning the agenda, and taking care of the logistics. They recruited EARTHS teachers from grades k through 5 who were experienced in implementing inquiry-based science lessons to lead sessions for the participants, all of whom were elementary school teachers from other sites. Separate sessions were held for each grade level, with approximately 15 teachers attending each of the six sessions. The institute took place over the course of 2 days, with workshops scheduled for 3 hours each day.

The teachers participated in science experiments and activities, designed lesson plans, and provided collegial feedback to one another. Session leaders discussed integrating NGSS into science teaching, trained teachers on how to deliver hands-on lessons, and then modeled teaching practices so that teachers could experience the lesson from the students' perspective. The district paid a stipend to the teachers who presented and offered snacks to the participants. Participating teachers could also report the time spent at the institute as part of the professional development hours required by the district. The district also provided new science kits with materials for hands-on lessons for elementary schools that did not have them and upgraded existing science kits to meet NGSS.

Teacher leaders followed up with participants online, where teachers could continue to share ideas and activities they had been working on. DeDe indicated that once teachers had tried out the new practices, the district would plan a midyear follow-up session to the institute. A participating teacher we interviewed said she was excited to have started planning her science curriculum and

figuring out how she was going to integrate what she had learned in Kathryn's classes into what she was going to do for the next couple of months. She also realized that this summer institute was a different kind of professional development.

> A lot of times when we go to professional development (I've been teaching for over 20 years, I've been to a lot of developments), you sit in there and you think, "These are great ideas, [but] I don't know how I'm gonna do it in a classroom," or "I think I understand this," and then you walk out, and you're like, "I don't get it at all," or "I don't know how to make this work in the classroom." The training that Kathryn did, she gave us so much realistic, hands-on materials and ideas and supported [us] so much. I think I can really integrate that into what I want to do when I come back from break. She did a really great job in doing the training and really giving us ideas on things.

She was happy to report that her students appreciated the new curriculum and the new ways of learning.

> They can tell the difference when I'm teaching from the book and when we're doing something that's much more integrated. They respond better.... We spent an hour and a half building elf traps today and I thought, "Oh, they're not gonna hold their attention. I'd better have a secondary plan. And they spent the whole hour and a half designing, talking to each other, showing each other, coming up with different ideas. It really was an amazing time. It was so much fun. And they learned a lot.

Toward the end of the year, Kathryn offered an apt summary of the work of Team Oak in CVUSD. She thought that it had moved the district forward and moved the teachers forward.

> A lot more teachers are talking about science, emailing me and wanting materials, and asking questions. And just from that alone I know that they're eager, and they're trying things; not just me sharing my knowledge.... So, I think by working with the district in tandem, and having our ILC PDs, along with what the district's science needs are for us, we're creating this whole system of, "This is what you have to do, and here's more support." So, a very beneficial way to utilize ILC.

Based on these successes, Team Oak planned summer institutes for the district for 2018 and 2019.

Team Redwood: Vertical collaboration

During the 2015–16 academic year, Ashley devoted much of her time to crafting lesson plans for Better Lesson, an online repository of lesson plans designed to support science teachers implementing NGSS. Although tangential to her work for the ILC, the Better Lesson work helped her build and refine her ideas for science pedagogy.

In 2016–17, teacher leaders formed a second Conejo Valley ILC team. We called it Team Redwood. The founding members included Ashley and Rhonda, two science teachers from the same high school; Jennifer, a middle school teacher; and Julie, a teacher in a k–8 school. With the ILC's original vision in mind, members of Team Redwood set out to use their knowledge and experience with teaching science to support elementary school teachers in expanding their pedagogical repertoires to incorporate the NGSS. Like Team Oak, Team Redwood used a three-stage approach:

deepen familiarity with NGSS, offer lessons to demonstrate instruction that addresses the new standards, and co-plan and co-teach science lessons with the teachers in the elementary school classrooms. To go deep rather than wide, Team Redwood created a pilot program to provide sustained and intensive support for teachers at one elementary school in the district.

Because two of the team members were also members of the county's NGSS leadership team, they deliberately and explicitly sought to align their pilot project with the efforts of the county and the district to roll out the new standards. Following several email exchanges, a productive dialogue began between an ILC member and an official from the Ventura County Office of Education (VCOE), who was able to provide feedback on initial plans. A VCOE representative we spoke with expressed his appreciation for the ILC team's approach. He recognized the benefits of coordination given the resources available in the county, the availability of data about areas of need, and information on which districts and which schools could most benefit from professional development programs. This educator also recognized the importance of providing not only single occasions for presenting content but also adequate infrastructure and ongoing support for teachers.

In August 2016, Team Redwood also sought the advice of district officials. Members of the team met several times with district officials and presented their initial plan. A senior district official described how she pushed the team to further develop its plans, which she considered "on the slim side in terms of the goals and objectives," with an initial focus on increasing alignment with the NGSS. Because the team members planned to focus on science and engineering practices, she also challenged them to seek input from industry professionals and to think about how they might make the connection between the teachers' professional development and student learning.

> When I met with them … I said, "So what? OK, so we're doing this, and we're gonna have some fun with some of the elementary kids, and they get to do a few engineering projects. But so what? We need to think about that question when we're talking about our plan and what our focus is going to be. Have you partnered in any way with engineers?" We have amazing manufacturing companies nearby with fantastic engineers, and it just seemed to be a really natural partnership that could occur.

Heeding the advice of other educators, the team reviewed its plans and resubmitted them to the district in October 2016. A short time later, the team approached a nearby elementary school, whose students would typically be expected to move on to the high school at which two team members were teaching. The team contacted the elementary principal to gauge her interest in workshops for teachers at the school. After she and several teachers recognized the potential benefits of a collaboration, they all started to meet every other week.

As a first step, the ILC team members conducted a short needs assessment survey with the k–2 teachers at the school. Ten teachers responded to questions asking about their comfort level with science, the frequency with which they taught science lessons, and their awareness and understanding of NGSS. The team found that the k–2 teachers at this school tended to complete science units by teaching three or four times per week, in alternate months. All of the respondents wanted more support for teaching NGSS science and engineering practices. The survey also revealed that most teachers were unfamiliar with the engineering design process and with 5E lesson planning, an instructional approach often used in science classrooms to support inquiry learning.[85]

Members of Team Redwood aimed to be responsive to the teachers' expressed needs rather than impose an outside agenda, as Ashley commented:

> I know that's funny to say [but] our plan was "no plan." [We said,] "Here's some topics our team feels like each one of us four team leaders could be experts on. So, which of these would you like? Which of these would you find useful? Where are you starting and where do you want to end up?" And so, it's really driven by their needs and what they were interested in.

They listened, learned, and adapted their original plans as they moved forward. They adjusted their expectations about the level and frequency of interactions needed to increase the teachers' familiarity with the standards. In her interview, Ashley continued:

> The first thing was introducing NGSS. We had a very basic presentation and we thought this would be no problem. And we realized very quickly that this was the first time many of them had heard these words, had heard these terms, these concepts, and it's really easy to forget how overwhelming it is once you've done this for so long. And so we decided to take a step way back and break it down even to smaller parts.
>
> So we'd have a small little presentation about maybe the crosscutting concepts and then what this would look like in your classroom. And then disciplinary core ideas [and] alignment [with standards and grade levels]. [We] thought that would be a quick announcement, and little did we know—we spent the entire hour on that because that was shaking their world.… They said, "Wait, I've always taught [for example] rocks. And now rocks are in a different grade. What am I gonna do?"

One of the ILC team members worked primarily with the kindergarten teachers, another met with the 1st-grade teachers, and the two high school science teachers worked jointly with the 2nd-grade teachers. They met for relatively short sessions to allow time for the teachers to develop familiarity with the standards. The topics covered during these sessions were the NGSS standards; the science and engineering practices; grade-level content maps as defined by the district; and resources for NGSS implementation, such as the NGSS website itself, Better Lesson with its rich menu of lesson plans, Engineering Is Elementary, and Mystery Science.

The ILC team members recognized the importance of developing trusting collegial relationships with the teachers rather than lecturing to them or "teaching" them.

> Many times, people come into a training and want to show how smart they are, but it doesn't necessarily mean that's the best thing for our participants.
>
> [Each session's presentation was] probably 10–15 minutes and then a lot of reflection and grade-level tables. "So, what would this look like in your classroom? What are current practices? How can we alter, update those to make them more NGSS oriented?" Not a lot of talking from the front, but a lot of talking side by side and saying, "How can we brainstorm? How can we make this an easy transition so that we can help your students get to where they need to go?"

The second phase of the project, in early 2017, focused on jointly planning lessons to be taught by the two high school teachers in the elementary classrooms. Team members and teachers discussed lesson content, material resources, and classroom logistics. Subsequently, the two high school teachers modeled three science lessons, one each in kindergarten, 1st grade, and 2nd grade. These lessons were built around content standards as well as science and engineering practices defined by NGSS.

The lessons modeled motion, stability, and forces in kindergarten classrooms; light and shadows in 1st grade; and erosion in 2nd grade. In kindergarten, students designed and built structures using different materials to model and investigate what happens when different moving objects (e.g., toy cars and pebbles that they threw) collide with stationary ones. They investigated whether the speed or the direction changed their experiments' outcomes. The 1st-graders, inspired by the "Bat-Signal" from the popular Batman comic books, designed and created a device for communicating with a new superhero. They explored the qualities of different kinds of opaque, translucent, and transparent materials (e.g., cardboard, wax paper, different kinds of fabric) when placed in the path of a beam of light from a flashlight or from the overhead projector. The 2nd-graders considered the conditions that affect the structure and the functions of natural and designed objects and that result in changes in the environment. Students used cups and sand to build small sandcastles and observed the effect of water overrunning the castles. In a follow-up lesson inspired by the demonstration lesson, a teacher who taught 2nd grade at the school used a hairdryer to model the effects of wind on the environment.

Throughout these demonstration lessons, the students had multiple opportunities to practice science and engineering practices. Among those, they used and developed models, made observations, compared different designs, made claims, and used evidence to support their arguments.

Vertical collaboration in action

To understand how the vertical teaming functioned in practice, we observed a co-taught lesson between Ashley and Rhonda, the two high school teachers from Team Redwood, and their elementary colleague, Karen Henige, in her combined 1st- and 2nd-grade classroom. Underlying the design of the lesson were central crosscutting ideas—such as structure and function—as well as biodiversity and adaptation. At the start of the lesson, Karen reminded the students of a previously encountered word: biomimicry. Referring to pictures of birds, she asked the students to turn to a partner and talk about why different birds might have different kinds of beaks. As students proposed their explanations to the whole class, the teacher responded by deliberately using science discourse (e.g., "observe carefully," "mimic," "set parameters," "survive in the environment").

Next, students worked in groups of four sitting on the lawn outside the classroom. Their task had three parts: (1) to pick up "bird food," i.e., sunflower seeds, cooked spaghetti, and a piece of soft and chewy candy in a shallow water container, by using "beaks," i.e., a spoon, a pair of tweezers, and chopsticks; (2) to discuss which beak was most useful for picking up which kind of food while consulting pictures of different birds sporting different beaks; and (3) to collect and report data by posting sticky notes of different colors in the appropriate boxes on a large 3 × 3 table with a matrix of the types of foods and types of beaks. Although the groups' responses tended to consolidate around particular findings, there was also variability.

All three teachers moved among the student groups, sat on the ground with the students, and engaged in conversations. They encouraged the students to ask questions of each other, describe their observations, and give reasons for their conjectures. In the debrief, Karen asked a few students to justify their group's decision and refrained from agreeing or disagreeing with one response or another.

Back in the classroom, the students reflected on their activity and wrote in their notebooks. Karen urged them to use the "thinking stems" posted on the wall to help them kick-start their thinking before formulating their answers. We recorded some of their sentences:

> *I noticed that* spoons worked on everything but worked best on seeds.
>
> *I figured out that* birds with skinny beaks probaly (sic) eat fish, the ones with long beaks might eat worms, and birds with roomy beaks probaly (sic) eat seeds.

The debrief meeting after the lesson was an important and potentially consequential part of the professional interaction among the three teachers. The conversation began with a review of the NGSS addressed with the lesson. The teachers discussed the manipulatives and resources that were available in the science kits and those that needed to be scrounged from recycling bins, office supply stores, and their own kitchens. They brainstormed ways the activity could be extended to include different environments for the "birds" to retrieve food, such as from a concrete surface or long grass.

Most of the meeting was devoted to discussing how students worked together in the groups. One of the teachers noted that several students who had been asked to represent the group by posting the sticky note were hesitant and looked for confirmation from other group members, indicating that the decision might not have been reached by consensus. Karen noted that although some group members were huddled around the same tray, they were not interacting and working as a group.

This lesson was the first opportunity for Team Redwood to co-plan and co-teach with an elementary school teacher. It was the culmination of several weeks of interaction that began with the needs assessment, continued with an introduction of the new science standards, and then moved to demonstration lessons by the ILC members.

In her interview, Karen noted how this experience had given her the opportunity to deepen her pedagogical content knowledge in science. She appreciated that the teachers were asked what they needed before the start of the professional development activities. She recognized that the new standards encouraged teachers and students to make significant changes in the traditional classroom culture. She also thought that children in k–2 were best placed to adapt to this new kind of teaching and learning while the children were still new to school, before more traditional habits of schooling had become ingrained.

Ashley and Rhonda also acknowledged the many opportunities for their own professional learning and growth in their collaboration with the elementary school teachers. For example, Ashley recognized that whereas teachers in secondary schools often have disciplinary expertise in the sciences, teachers in elementary schools typically understand the social, emotional, and academic development of their students very well and can plan appropriately for their learning progressions.

Shared goals, different strategies, perennial challenges

ILC members from both teams in CVUSD recognized some of the same learning needs and learning opportunities for teachers in the district. Among the most pressing were increasing teachers' familiarity with NGSS and shifting instructional practices in science lessons. The focus on providing support in teaching science to elementary school teachers aligned with district policy. The teams chose to respond to the learning needs of the teachers in the district in parallel yet distinct ways, from webinars to demonstration lessons, from arranging large-scale workshops to focusing on three grade levels in a single school, from online follow-up to frequent face-to-face interactions with a single teacher. Yet each of these approaches presented challenges.

Both teams identified lack of time, scarcity of adequate financial resources, and sparse incentive to implement deep changes as perennial barriers to meaningful instructional change. Meetings and PDWs and institutes always had to be scheduled around the many other meetings in the district, meaning it was difficult to find time for them. DeDe explained some of the logistical challenges:

> Well, we have certain limitations. All our workshops are after school. We don't have nighttime or weekend [workshops] because we can't get enough people to come. We can't do Tuesdays because Tuesday afternoons are reserved for staff meetings at schools. We can only do every other Monday, because the other Monday is our union meetings and they're open to everybody in the union, so we have two Mondays a month and Wednesdays and Thursdays.

Certain times during the school year are more difficult to navigate than others. Meetings with their elementary school colleagues during school hours meant that Team Redwood members had to navigate around each other's teaching schedules. Ashley and Rhonda, the high school teachers, needed to arrange for substitute teachers and coordinate with their principal. These teachers were conscious of the challenge this presented: balancing close support for elementary school teachers with their own teaching responsibilities and commitment to their students.

Team Redwood members realized that the deep work with elementary school teachers required personal contact and the development of trusting relationships, given the important differences in school culture and the different ways teachers from the elementary schools and secondary schools communicated with each other. Ashley and Rhonda, the high school teachers in Team Redwood, also came to understand that although they could offer content knowledge and science-specific instructional strategies, there was much they needed to learn about working with younger children. For example, the two teachers were somewhat surprised to learn that elementary school students were not writing as much as they thought the students would. As high school teachers, they were used to a lot of writing in their science classrooms and took it for granted. While working with the elementary school teachers and students, the ILC members had to take a step back and adjust.

Members of the ILC teams in CVUSD remained committed to and focused on their vision and plans. The summer institute alone had reached approximately 70 elementary school teachers, a substantial proportion of the nearly 400 in the district. From 2014 to 2017, ILC team members had reached several hundred additional teachers in workshops in the county and statewide. Teachers who attended presentations by ILC members—who had participated in the webinar, workshops, and summer institute—gained increased understanding and experience with the NGSS-inspired curriculum and pedagogy. The numerous collegial interactions among the teachers from different schools and different grade levels had many positive and highly productive outcomes.

Teacher-Led Professional Learning Takes Root in Conejo Valley USD

A key goal of the ILC project is that it become sustainable and ongoing, building deep partnerships, including resources contributed by the local community. The ILC calls this "taking root." After a 3-year presence, the ILC project is becoming well established in CVUSD. ILC members as well as the district teachers and administrators have invested much effort, time, and financial resources in the ILC teams' work. The teachers with whom we spoke appreciated that professional development activities were led by teachers who were from the same district. As such, they were familiar with the district; its policies, priorities, and politics; and its affordances and challenges.

A key goal of the ILC project is that it become sustainable and ongoing, building deep partnerships, including resources contributed by the local community.

Collegial collaborations that support teaching and learning

With financial support from the district administration and with schedule adjustments and workshop space from school administrators and the VCOE, the ILC teams built relationships with many stakeholders and thus increased their impact. The teams maintained strong communication with the district, and the ILC work became an integrated part of the district's professional learning. As DeDe put it, the ILC project filled a need and continued the district's existing teacher-led professional learning:

> The ILC when we first started was like a little drop in the bucket. Now it … is a sustaining and ongoing [model] of teachers providing teachers with professional development.… We had this huge shift in what was funded, the way it was [done], and the support in the district for it. So, the ILC is … standing alone now, and I do know that teachers really do respond to getting mentoring and instruction and support from other teachers, whether it's ILC folks or however it's set up.

The principal of the elementary school whose teachers worked with Team Redwood appreciated the consistency of the collaboration among the teachers from the different grade levels—a necessary condition for bringing about the anticipated instructional shift. She also noticed the difference between ILC and traditional workshops. In the ILC workshops, teachers work together and draw on each other's experience to put good ideas into practice in their classrooms.

When collegial collaboration produces observable results, it expands and deepens an already positive school culture. It builds trusting relationships and mutual recognition of professional competence. It allows colleagues to be open and honest about their professional needs and to seek and offer support and advice. Numerous stakeholders in the CVUSD recognized the benefits, confirming a finding in the literature that ongoing professional relationships with colleagues improve teaching.[86] For example, Karen recognized that continuous professional relationships with the ILC team led to instructional shifts as she gained confidence in using hands-on science experiments.

Furthermore, the district recognized that the ILC's work toward vertical alignment was particularly valuable. One district representative appreciated that teacher-led professional development integrated certain practices, such as modeling, co-teaching, and reflection, rather than presented them as isolated events. Another representative lauded secondary teachers' support of their elementary colleagues in service of goals beyond their own schools. She added that by supporting a hands-on approach to science and learning through doing, teachers helped level the playing field for students such as English learners.

The district recognized that the ILC's work toward vertical alignment was particularly valuable.

Despite the ILC teams' positive contributions, district representatives were pragmatic about the pace of change. They recognized the many challenges to welcoming fresh ideas and implementing nontraditional instructional practices. One district representative said:

> Absolutely [we saw changes] for lesson planning and professional learning. We've really worked on a differentiated approach for that. I think that [the teachers] have choice and they can self-select different components in there. As far as lesson planning, definitely.… Has there been a radical shift? No. We're on our rollout. It's not like all of a sudden [the teachers] were like, "Wow, we love science today. I've been avoiding it for years, but today is my day." Although we are engaging them. I think that they are getting more excited about science.

Developing and fostering relationships for sustainability

ILC team members were resourceful and strategic in their efforts to secure the support of school principals, district and county officials, and teachers union officials. For example, securing appropriate space for professional development in science involves identifying a site, preferably a science classroom with the necessary equipment and materials; obtaining permission from the principal to use it; and arranging with the janitorial staff for cleanup. Kathryn offered two model lessons at her school site with principal approval, and the summer institute led by Team Oak was held at EARTHS magnet school. Similarly, the principal at Team Redwood's high school authorized release time for them to co-plan and co-teach with the elementary school teachers.

The district included ILC-led workshops in its professional development offerings and calendar, which helped to avoid conflicts with other workshops and events. District officials deemed participation in ILC-led workshops as partial fulfillment of teachers' required professional development days or hours. Such recognition had considerable financial implications, as these were occasions that teachers were not with students yet received their full salaries.

The district also supported ILC workshops with snacks for participants and provided stipends for the presenters. DeDe, a district Teacher on Special Assignment (ToSA), was able to coordinate many of these demands, as her Team Oak colleague, Kathryn, observed:

> My district partner has really helped me by not only calendaring these things, because that's actually a challenge. She can calendar when they're happening and [make] sure we have a venue and … all the technology that we need to do our

> presentations, and simple things like snacks and goodies for people. That's a big deal, too. But she also includes our ILC PDs into the district PD. So about once a month, the district will send out kind of a menu of options like, "Here's what you can attend this month." She puts us into that as well, so we're part of the district here [too].

In a subsequent correspondence, Ashley informed us that she and Team Redwood made a presentation to the superintendent, the assistant superintendent, and the high school and elementary school principals about the successes of their work. The ILC teacher leaders also shared their desire—as well as a concrete plan—to create an NGSS Mentor Team of six high school science teachers to serve as mentors to at least two elementary schools in the district. The newly appointed superintendent approved the program and included it in the Local Control and Accountability Program. Ashley wrote, "I wanted to share this advancement in district support to further solidify the concept [that] teachers helping teachers is the most effective strategy to initiate change and improvement in our instructional practices."

At the county level, the VCOE played an important role during the statewide rollout of the CCSS and NGSS. It hosted numerous events designed to spread information to teacher leaders, staff, and administrators from different districts. The county office was also instrumental in connecting its leadership team, ILC members among them, to other educational resources and organizations, such as the K–12 Alliance, Bay Science, and science educators at Stanford University. One district representative described the value of this coordinated approach as follows:

> There's one set that's the leadership network. I have a group of teachers that go to that. Then there's the offering they had yesterday regarding assessment. I had many members of my team and then some extra teachers as well that wanted to go. We sent people to that. I think that really, we work hand in hand to make sure that we're up on the newest information coming out, or we also use our county [representative] who has come and presented and completed PDs in our district as well. It's like a web. It's just everybody working together to support teachers in learning and to support quality instruction and, ultimately, student achievement.

The ILC members who served on the county office–sponsored NGSS rollout leadership team received curricular support and planning resources for their activities. Team Redwood developed a solid relationship with officers at the county office.

The district and the United Association of Conejo Teachers, the local CTA affiliate, had an agreement that 6 of teachers' 12 required professional development hours could be teacher-directed. According to Courtney, an ILC member and local CTA representative, these hours were intended for peer collaboration. These 6 hours could be fulfilled on a school site or, with authorization from the principal, could be used to attend professional learning opportunities at alternate sites. The cooperation between the district administration and the teachers association gave ILC members the flexibility to offer workshops and gave teachers the incentive to attend them.

The association also directly supported the ILC teams in getting the workshops off the ground. For example, in the ILC's first year, the regional branch of the CTA sponsored a professional learning day that included a presentation by the ILC members. It also provided refreshments, and the

local branch paid for the lunches. Team Oak reported that the local CTA representatives provided encouragement and feedback on the work of its members. Ashley and Courtney from Team Redwood spoke repeatedly about the curricular and instructional support provided by the CTA. Courtney said:

> The CTA … [has] said for years [that it] believe[s] strongly in making the teaching profession better. I think for us to remain relevant as an association, we need to keep focusing on things like the ILC, and that's why I believe so strongly in it.… I love that [the CTA is] actually trying to do this.

Teacher learning and leadership development

In the course of routine activities, fundamental changes in teachers' classroom practices can be difficult to capture, but here we present self-reports from the district and educators on the professional and personal growth that came from participating in, planning, or leading ILC project activities. District representatives were positive about the outcome of the ILC project activities, particularly for the teachers who experienced follow-up and coaching. Though cautious regarding the impact of the ILC project in the district overall, they agreed that tailoring the PDW content closely to the teachers' expressed needs meant that teachers were more likely to shift some of their instructional practices. Courtney noted some of the challenges stemming from traditional or single-workshop professional learning they sought to address with ILC workshops:

> I think we've tried really hard to keep [PDWs] relevant and to make it like, "Hey look, this is something you can actually do tomorrow in your classroom." Because so often that's the problem with [traditional] professional development—you walk out and you're like, "It doesn't really apply to what I'm trying to do, so I can't do it."
>
> A lot of times it's a great idea and you really wish you could implement it, but it's going to take you some time to actually set that up and get it going. And then you get back into the daily grind of the classroom, and that notebook that you have with all those great ideas just sits on the shelf, and then it's gone. And I think … the inherent problem with [much traditional] professional development is that teachers are so busy doing their job that they have such a hard time incorporating new things.

A teacher who participated in the summer institute organized by Team Oak described her preparation for a new science unit in her 2nd-grade classroom and her plan to integrate it with the work in language arts:

> For reading and language arts … we're taking them from just learning how to read to really read[ing] for information, and so we're expanding [students'] reading skills. But we're also teaching them how to read deeper into text, and then writing—developing some good writing [skills], paragraph writing and opinion writing, letter writing, those kind[s] of things for 2nd grade.
>
> I try to look at the readings, the general reading skills that I should be teaching for the week, and I try to look and say, "OK, how can I teach that in science? Can I bring it out in a science lesson?" Or … [if we're] going into our earth science, well that's a perfect time to start teaching about maps, and that the world is bigger than they see right now, and so I just try to see where it overlaps, and I try to make sure I hit all the standards, and it's not easy. I think it gets easier the more time you spend, but it's not easy.

A district administrator had noted some positive shifts in the flow of the lessons, both in perceptions of the teacher's role and in specific skills, such as developing disciplinary discourse in context. She also noticed increased student engagement:

> The changes that I've seen in the classroom have been with the fact that teachers now don't feel like they have to "front-load" science vocabulary and information that comes naturally through. I've also seen the integration of sentence frames to support the students. I think that is really new. Then I think the new concept for many of the teachers, too, is the fact that you're a facilitator, you're not teaching the science. You're facilitating the learning. The kids are not distracted [and] off-task. They're engaged in their own learning process. I think that for some of our teachers, that's been a big shift. To them, they [previously] had to control everything to make sure that [children were] focused and behaved.

Rhonda, a high school teacher from Team Redwood, noted the increased confidence of elementary school teachers to teach science. She underscored the value of demonstration lessons:

> Now they're not so scared about it [NGSS]. They have an idea of what the words [in the standards] mean and where they can find things, but now they're not intimidated. They know that they can easily find an activity and then think about how it relates and how that would translate. That's teaching style, so that's going to take a little longer. I think when they saw us teaching it and they saw how different it was from how they're teaching, that was the biggest thing.

Because of myriad pressures and time constraints, neither administrators nor district personnel had enough opportunities to visit teachers' classrooms to observe and systematically document the potentially more and deeper shifts in instructional practice. ILC members, who are mostly classroom teachers, also could not make regular visits to their colleagues' classrooms to observe and provide feedback. Despite these constraints, Kathryn of Team Oak was encouraged by the ongoing potential of their work and by the enthusiasm and buy-in shown by participating teachers and administrators:

> Principals are asking a lot more questions and wanting more information, and people [are] wanting materials and kind of hounding our curriculum office for more instructional materials for NGSS. So, therefore, I know that they are at least thinking and talking, and the conversations are happening. We saw that starting, and so then we went and actually presented to the elementary principals at a principals meeting, so they could get the same knowledge that their staff was getting. So, we're seeing it starting to roll.

ILC members were also proud of their work and accomplishments in terms of leadership development. One said in her interview: "I think we all feel really good about the work we're doing, and here's the thing: If it weren't for us, I don't think this work would be getting done." She considered that they were engaged in a grassroots teacher movement:

> Think about it this way. [Some] districts have a vision that they need to be doing [professional development]. Their idea is to bring people in from the outside. When ILC first started, that's what I saw … and the ILC was saying, "Wait a minute, you've got people right here. You've got resources right here." … We happen to have some

> very talented science educators who do work for the county and do other kinds of work, who are really aware of it and are really passionate about it, so it was definitely a grassroots, teacher-up [effort].

For Rhonda, participation in the ILC project meant empowerment:

> It gave me power to say, "I think this needs to happen," and it gave me the support to make it happen. So, we thought this would be a good idea. We've been talking about it. We felt like we could do it and they gave us the support to get together and say, "Hey, you can do this, and let's make it happen."

Her colleague, Ashley, felt empowered as well and appreciated the support of institutions that created the project:

> It's a unique project. It's really exciting to think the power of an idea could make that big a difference. And I hate to say it, [but] as a classroom teacher you're not used to being able to have that kind of exponential influence. But that's what CTA and Stanford and the National Board [are] doing with this project: … giving teachers that ability to identify a need, go and fill it, and then be able to provide that lesson or skill set to others. So that's pretty exciting.

Her sense of efficacy was palpable:

> Anything's possible when it's best for students and teachers. And I think we shouldn't let what we've done prior, expectations or prior practices, limit us from being creative to be able to venture into new territories. So I think that's really important. So, who are my allies? [My ILC team members], our principal. And really CTA. They're powerful. And they're so smart.

Courtney felt that in addition to having had the opportunity to become a "much better presenter," he was offering teachers something practical "and even if it's just a philosophical shift, they can go back and do something with that the next day in their classroom."

Kathryn recognized the positive reputation the ILC project and its members have garnered in the district when she said, "Everybody wants us to do something, and everyone within the district and now county knows my name and my ILC team's name." She also emphasized the role she and her ILC colleagues can play in sustaining the model of "teachers teaching teachers" in the district.

> I think it's a sustainable model. So the fact that we have a plan for the future is really important. I also think … each member of my group has different strengths to bring to the table and therefore we kind of took different parts in our plan to help each other. We honored each other's differences in strengths. When you're thinking about what you want to do for your ILC work, make it something that is a need within your local community or your local district. By recognizing what [teachers] need, I was able to get more support from [the district].

The ILC members did indeed "lead from the middle." They shared professional knowledge and pedagogical practices, they built collegial networks to support the professional learning of their colleagues, and they contributed to the development of collaborative professional cultures in schools.[87]

Student learning

Reliable measures of progress in students' learning take time and financial resources to collect, analyze, and attribute to any one particular educational intervention or program. Yet the educators we interviewed and observed were encouraged by what they saw.

Members of Team Redwood and elementary school teachers who co-planned and co-taught the science lessons were able to use formative assessment strategies and conduct pre- and post-test comparisons. Ashley, a high school teacher and Team Redwood member, made a connection between teachers' learning and their students' learning. From her experiences modeling classes and co-teaching in the elementary school, she felt that elementary school teachers realized the power of the new science standards by witnessing their students' engagement and sense of wonder.

The ILC team members found that student learning in classrooms whose teachers had implemented the 3-day thematic unit was significantly enhanced compared to student learning in classrooms whose teachers could participate in the 1-day demonstration lesson only. These initial positive results were encouraging and motivated the teachers to persist in their efforts, as Ashley explained:

> We were able to suggest thematic units; we had one teacher who implemented all three lessons, and by looking at her student data, [we saw] an obvious difference between the [teachers who did the] 1-day lesson … versus the one that did the 3-day consecutive lesson. And the student achievement was not even close. The ones that had the multiple days of hands-on inquiry lessons performed much better and had a higher level of understanding with the models that they created.

Karen described the engagement and the enthusiasm of her students:

> I think it's great for the kids. You know, my kids will end up at [Team Redwood's] high school, so they kind of see this as, "Oh wow, science is something that my big brothers and sisters do." And it raises their level of feelings towards science, that it is an important thing to learn.

She elaborated, "Students were learning science by doing science"—one of the central tenets of the NGSS.

A district representative made a more general observation. She noted that shifting teaching and learning in the district toward the NGSS required a concomitant shift in mindset from both teachers and students:

> What's hard for so many of our students is that they're always looking for the right answer. There isn't always a right answer, or there are multiple right answers, or there is no answer. That can be really frustrating for some of our students, or our perfectionist students who want to go back and back and try to make sure that we do everything with such specificity: "Why did we get the 'right' outcome? Why did we get that good outcome?" The ILCs have really brought a lot to our district in not only the science area, but as a model for professional development.

The representative noticed that overall, with multiple acceptable outcomes, students in the district were more apt to take risks in their classroom work. Such a shift in students' dispositions toward science was particularly important for the community. She attributed this outcome to the professional learning work of the ILC teams.

Many teachers and administrators we interviewed felt that a major benefit of the ILC project was providing enhanced learning opportunities for teachers who could then offer increased learning opportunities to students who had different interests, strengths, and needs. Attention to science and engineering practices, crosscutting concepts, and disciplinary core ideas brought about shifts in teachers' understanding of students' learning needs.

A major benefit of the ILC project was providing enhanced learning opportunities for teachers who could then offer increased learning opportunities to students who had different interests, strengths, and needs.

Teacher Learning Continued

In a recent conversation, Ashley shared with us an update on the continued work of Team Redwood in Conejo Valley USD. She explained that the collaboration of the two high school teachers with elementary school teachers, now in its third year, has served as a pilot or "proof of concept" for a districtwide approach and is included in the district's Local Control Accountability Plan. In lieu of one full-time ToSA position, the district engaged a team of six current teachers to support NGSS professional learning, including two members of Team Redwood. This group consists of three teacher pairs, each composed of a life science teacher and a physical science teacher. They are able to spend 1 hour a day serving as NGSS mentors, primarily for teachers from the elementary schools that feed into the district's three comprehensive high schools. The mentorship work is part of the high school teachers' contractual assignment. The team of NGSS mentors will create professional development sessions, find resources for the elementary grades, meet with the teachers, and co-plan and co-teach classes. They have been helping the elementary school teachers analyze their current curricula and activities to align them with the NGSS. The district showcased this activity as the best practice for the district. The ILC leaders also served as "best practices experts" at the County Office of Education's Best Practices event in February 2019.

According to Ashley, the district chose to highlight the NGSS program because of "the importance of teachers supporting teachers [and] its financial value." She continued, "We are stretching the budget and [the district is] getting a lot in return." Furthermore, the recognition from and the support of the local CTA, the Unified Association of Conejo Teachers, energizes and affirms the work of the ILC team members.

Key Takeaways

Between 2014 and 2017, the two CVUSD ILC teams focused on implementing the NGSS; vertical k–12 alignment; and building school-, district-, and county-level relationships. They used different designs and strategies for successfully supporting teacher professional learning. Key takeaways include the following:

ILC teams created trusting collegial relationships that furthered their work by developing approaches responsive to the professional learning needs of teachers in their district. Both ILC teams recognized a professional learning need in NGSS and science teaching and used varying strategies: Team Oak developed leveled workshops and hands-on institutes to provide a differentiated approach to professional learning in NGSS, and Team Redwood shaped the nature and intensity of professional learning based on feedback from participating teachers.

Teachers with strong backgrounds in teaching science supported their colleagues' NGSS and science learning. Participants in the ILC workshops and institutes gained greater clarity of the NGSS goals and disciplinary frameworks and recognized the profound changes in instructional practice that the implementation of the new standards entailed. Secondary school teachers involved in vertical teaming applied their content knowledge and experience with hands-on science lessons to support their elementary school colleagues. ILC members further developed their leadership skills and felt empowered to support the teaching profession.

Where it occurred, sustained follow-up enabled changes in instructional practice. Shifts in classroom instruction varied given the financial, structural, and temporal constraints. Teachers who benefited from sustained interactions with the ILC members—such as co-planning lessons, sharing lesson plans, or observing each other's instructional practices and debriefing—reported concrete changes in the way they taught and the way their students learned. Scheduling and logistics for teacher follow-up were key challenges.

ILC members' work was enhanced as they established valuable relationships with county, district, union, and school administrations. ILC teams were proactive in their approach to building relationships. For example, they aligned their efforts with the NGSS work of county and district offices, developing trust and allowing them to draw upon intellectual and financial relationships to support mutual goals. These relationships are and will be critical for sustaining the project. The local CTA affiliate was helpful in negotiating the conditions under which teachers in the district could choose their professional learning opportunities. SCOPE and the CTA provided further support to ILC members through their continued involvement in the activities of the statewide ILC project.

Chapter V: ILC North Orange County: The Potential of Teacher Professional Networks

> It's become now a family, it's become friends, it's become this professional development community that is not artificial but is ingrained in a love and a passion for helping both teachers and kids in the classroom.... It's because this is a really unstable time for education, and we're finding a way to help bring some stability. And that stability isn't top-down; that stability is teachers planting the roots and then growing outward, so that the top gets covered and the bottom gets covered.... It's empowering, it's exciting, ... and what's happened with [CSU] Fullerton being the seed and the catalyst for spreading some of the roots in Orange County.
>
> —Teacher leader, Orange County

ILC North Orange County: Leveraging the Potential of Teacher Professional Networks

Strengthening the teaching profession in North Orange County has been the goal of local ILC teacher leaders for the past 4 years. In this case study, we describe the multifaceted work of a network of ILC teacher leaders in North Orange County and its impact through its conferences and workshops to support teachers in implementing the CCSS and NGSS. The ILC's team members have established mentorship programs by reaching out to the College of Education of the local California State University (CSU Fullerton) to connect their students and teacher candidates with mentor teachers. They have developed a mentorship program for high school students that is designed to recruit and establish pathways to teaching. They have facilitated communication among teacher leaders as they shared information, strategies, and tools for teaching at statewide and regional conferences. And they have offered advice and support as teacher leaders have sought to lead professional development workshops in their home districts.

In this way, ILC teacher leaders located near CSU Fullerton and some surrounding school districts in Region IV of the CTA have assumed responsibility for leading the profession. Unlike most ILC teams, the Fullerton ILC team expanded beyond the original charge and created a teacher leader network in North Orange County—a network within the ILC network. It is an example of how dedicated teachers can identify several pressing needs in their region and build ties with organizations and institutions that understand and support their efforts.

A seminal article about teacher networks asked why so many teachers are averse to conventional in-service workshops and generic staff development programs yet are enthusiastic about collegial networks that offer professional learning and leadership development.[88] The answer is that such teacher networks are responsive to teachers' professional needs and the needs of their students in a particular context. They share resources and strategies that have worked for them. As teachers find themselves in the company of colleagues who share their educational vision and goals, they overcome the draining feelings of isolation. In networks, teachers' knowledge and experience are recognized and valued and their voices are heard.[89] Professional networks give rise to teacher leaders who are able to recognize opportune moments and productive ways to further their communities' cause. Several ILC teacher leaders did just that.

The ILC North Orange County Network

With roots in previous teacher leadership networks, the ILC members in North Orange County have made significant contributions to the profession that have been recognized and valued by their colleagues. Members of the network contribute at different levels and with variable intensity based on their areas of interest, professional strengths, and availability. The network is based around four to six members who are key to the design of the work and 20 members who contribute to key events and activities. The key members were:

- Al Rabanera, a secondary-level mathematics teacher with extensive professional development experience at the local, state, and national levels. He is an award-winning educator and a native of Orange County.
- Armandina Turner, a 40-year veteran with considerable experience in both private and public high schools. She has worked with many pre-service teachers and is passionate about sharing with others effective instructional strategies that support student learning, especially in mathematics. Al and Armandina worked at the same school and have presented many workshops together.
- Karin Barone, a 17-year veteran who taught language arts for 4th-grade students and science for 5th- and 6th-graders. A National Board–certified teacher, she was also a district trainer and taught groups of teachers about critical and creative thinking strategies. A board member of her local union, she served on the state CTA Curriculum and Instruction Committee.
- Camie Walker, a veteran teacher who taught teacher candidates at the University of Phoenix. In joining the ILC, she focused on helping elementary school teachers, who were mostly liberal studies majors, implement NGSS.
- Robert Bassett, a resource specialist with a dual master's degree in Curriculum Instruction and Education Administration who also taught at the University of Phoenix. He held several leadership positions in his district and served as an elected member of the union's executive board and chair for its professional development activities.
- Myra Deister, a veteran teacher who taught mathematics and computer science and served as her site's Technology ToSA. She was active in her local union and later served on a committee to write the California Computer Science Standards.

Early challenges and network formation

The ILC offered these experienced teacher leaders further opportunities to contribute to their profession with a solid approach and well-organized support. Al described it as follows:

> That's how ILC helped, because they came up with that initial network and the structure [of the professional development workshops] so everybody knew what their responsibility was and what they had to do. That was the standard that they had set and what we were to rise to.

Karin commented that she "saw the ILC as an opportunity to continue to grow my skills" in professional development and to "collaborate with other teachers who were doing what I was doing, trying to offer professional development for other teachers." The ILC showed the way for teachers to "embolden their practice," as another ILC member observed.

At ILC conferences, organizers grouped ILC members from CTA's Region IV into three geographic areas—San Diego, Riverside, and Orange County—and then into several district ILC teams within each area. This conference time allowed teacher leaders to build relationships within and across areas. When ILC teams returned to their home districts, teacher leaders attempted to organize professional learning opportunities for their colleagues in their immediate settings, including at district offices. However, over time, the teams had varying and, for some, discouraging experiences. Some districts appreciated their ideas, but others were not ready to support teacher-led professional development and continued to invite "outsiders." Some teachers with whom we spoke interpreted this as "top-down" district policy.

One ILC member felt that her district's administrators held limiting views of the teacher role: that teachers should focus on teaching, and in keeping with the status quo, districts should pay for consultants to deliver professional development or to hold internal training for their ToSAs. She was thus unable to persuade them of the value of experienced teachers contributing to their colleagues' professional learning.

Another ILC member noted that although she had an amicable relationship with her district administrators, she had difficulties coordinating the logistics of offering PDWs. So, she initially chose to offer PDWs out of her local union office. This had the dual advantage of demonstrating to the union the teacher leaders' expertise and demonstrating to teachers the union's role in supporting their professional learning. She said:

> I have a relationship with the curriculum coordinator for the district, so there have been times when I've said, "I want to do a training after school where you pay people." [The coordinator replied] "Absolutely, but it's really hard because there's so much going on at our district office that to get a time slot to do that is difficult."… So I'm like, "Let's bring that back, and let's try to run trainings through the union instead," which was twofold for me: (1) to get teachers to understand that your fellow colleagues have skills and expertise in an area that they can train you in … [and] (2) to help them see the union is [about] more than just bargaining your contract; there's more to offer and more support that we can give you than just that. That was important for me.

A third ILC member said that the level of engagement had varied with different district administrations. Although it had recently gained traction, he noted how earlier district staff had unfortunately perceived ILC workshops as competing with district efforts:

> I know our new teaching and learning associate [superintendent] … was involved in different things with myself, and she's a great asset to us now.… [Past leadership] thought teacher-led professional development had been trying to overtake their job, rather than to help them with their job.
>
> To me, I'm trying to save you $10,000. You don't have to pay for a guru with a book. You have people here that will do it for free, just because they want to share it with you. You will see your [teachers'] talent, and maybe they can get a promotion out of it.

Additionally, ILC members from one North Orange County district said that although their district seemed receptive, the pace of the administrators' response was slower than they preferred. For example, ILC members noted that ideas on growth mindset they had encountered at ILC

conferences eventually filtered to the district level through their personal relationships with administrators. Although the district seemed increasingly open to newer ideas, ILC members were not given opportunities to host PDWs. These perspectives point to the need for awareness and involvement from school and district administrators due to their role in allocating resources and acting as instructional leaders.

Faced with these uneven uptakes and insufficient engagement from their home districts, several ILC members began to look for alternative venues to collaborate and offer professional learning opportunities to their colleagues. Several of these teachers emerged to initiate and coordinate their efforts as they gravitated toward a budding professional network in North Orange County.

Karin recalled how the idea of doing joint workshops initially arose from a casual conversation at an early ILC conference:

> I think it was the first year of [the] ILC. We were at a table—me, Al, and a couple other people—and I had said, "You know, why are we just thinking [about] training in our own district? I think we can think bigger than that, because let's look at who we have sitting at this table. We all have different expertise. We could find a site and do a bigger training."

Partnering with the university

This ambitious plan began to materialize when Al contacted a mathematics professor he knew from the Orange County Mathematics Council, an organization dedicated to improving the teaching of mathematics. The professor advised Al to reach out to CSU Fullerton and ask for permission to use campus facilities to host a professional learning conference for teachers. The request was granted. Al also contacted ILC colleagues in Orange County, and they responded enthusiastically. On very short notice, the group organized what became the inaugural Teachers Teaching Teachers (TTT) event. Al recalled:

> A group of ILC members from Orange County decided, "We're going to do this. We're going to have a PD at Cal State Fullerton," and I'd never helped to organize or lead anything like that before. Two days later, I get an email from [my contact at CSU] stating, "I got you six rooms and here's the date."…
>
> It [was] just a crazy 8 weeks: "How are we going to do this, how are we going to raise money, how are we going to get the word out, [and] how are we going to get the presenters together?"

The first TTT event was held on a Saturday morning in May 2015 and offered simultaneous workshops in two timeslots. Sixteen presenters offered 11 workshops across the two sessions. The majority of presenters were from school districts in Orange County, with others from further afield, including Riverside and San Diego counties. Following the proclaimed mission of the ILC project, presenters aimed to offer participants practical and effective strategies for making the instructional shifts pertinent for implementing the CCSS and NGSS. Workshop topics ranged from cognitively guided instruction in mathematics, to using textual evidence to support a claim, to strategies to engage struggling students. (See Appendix C.) Approximately 100 teachers attended.

Holding the event at CSU Fullerton turned out to be particularly consequential and beneficial for the North Orange County network in several ways. First, through connections with the university's College of Education, the organizers invited students to the event, thereby opening the door to future initiatives for professional learning across the teacher education continuum. Second, the event ignited the attention of the education faculty at CSU Fullerton. In an opening address at the inaugural TTT event, the dean of the College of Education issued an invitation to the team to return to campus for future events. In September 2015, just 4 months later, the team organized the second TTT event on the college campus. Third, ILC project members and representatives of the College of Education established productive professional relationships that were to produce significant outcomes. For example, the dean advised Al to connect the network with additional organizations and embed the TTT into those organizations' programming.

Extending the TTT conferences

In a follow-up conversation, the dean referred Al to Aimee Nelson, Director of CSU Fullerton's Center for Careers in Teaching (CCT). Aimee, Al, and other organizers extended an invitation to the conference to members of the Student CTA (SCTA), the campus-based union affiliate for teacher candidates. A significant professional resource and dedicated supporter of the goals of the conference, Aimee assumed a crucial role in organizing future TTT events and the mentorship programs that they engendered.

The CCT offers comprehensive academic advising to CSU Fullerton prospective and current students planning careers in education, information and resources about the college's teacher education programs, and support for future teachers at any stage of their pathway.[90] The center also offers academic counseling to future teachers attending community colleges who plan to transfer to CSU Fullerton. As Aimee explained, an important aspect of the center's activities is outreach and advising:

> In the center, we probably see about 800 to 1,000 students a year. Probably really more than that, if you consider we also go out to community colleges. We do workshops or presentations. We go to transfer fairs. We'll visit high schools when requested. We do presentations on campus. So just our one-on-one advising, we see about 800 students a year, but that's just one piece of what we do.

Aimee's role as Director of the CCT afforded further opportunities for extensive and productive collaborations with the North Orange County network. She joined Al as a key collaborator to organize the second TTT event in September 2015. With a greater number of sessions and presenters than the first event, this second event included three concurrent sessions, making it a whole-day event. The number of members of the planning committee and presenters rose to 40. Attendance at each of the 21 sessions ranged from 5 to 30 participants. Structured as workshops, the sessions focused on CCSS- and NGSS-related topics such as understanding the Standards for Mathematical Practice, developing project-based learning, fostering academic conversations, increasing depth of rigor, creating assessment strategies such as performance tasks, and using assessment data to improve learning outcomes.

The conference strengthened the institutional connections between CSU Fullerton and the North Orange County network. Al and his colleagues in the network, as well as Aimee and her staff at the center, recognized the many benefits of the collaboration. The network gained access to a permanent and quite prestigious conference site and received the endorsement of the College of Education. The CCT gained learning and network opportunities for future teachers.

For the CCT, the interactions among veteran teachers and students who were considering joining the profession during the conferences and beyond were constructive and valuable. Veteran teachers could share their knowledge and experiences. Teacher candidates and other students learned about innovative teaching strategies and recognized the value of teacher professional knowledge and the potential of a collaborative and connected teaching force. Aimee described the workshops as of great value to her students. Holding the event at the CSU Fullerton campus provided convenient access for the center's students. They felt comfortable attending and engaging in meaningful interactions with the presenters and other participants. As word of the conferences grew, several faculty began to offer students extra credit for attending the events.

The network held a total of six TTT conferences between 2015 and 2017. About 60 teacher leaders made presentations and conducted workshops. Members noted that as the TTT conferences grew in reputation, they attracted presenters and participants from across all of CTA's Region IV. Participants' feedback was positive. From the September 2017 TTT conference, for example, in response to the statement "The workshop was valuable," on a scale of 1 (not at all true) to 5 (very true), the average of the responses was 4.39. Using a similar scale in response to the statement, "The workshop session gave me information and tools that I can use to support the implementation of the new California Standards/NGSS in California Public Schools," the average of the responses was 4.34.

Developing instructional practice: Potential and challenges

Teacher leaders gave positive yet measured assessments of the impact of the TTT conferences on instructional practice. Al noted that it was inherently valuable to bring together teachers from different districts, give them opportunities to exchange lessons learned from their experiences, and hear their perspectives on how to adapt instructional shifts in their different contexts. TTT conferences also afforded opportunities for cross-disciplinary collaborations among teachers and teacher leaders.

Yet with participating teachers coming from several districts, organizing follow-up sessions—central to the ILC's theory of action—was logistically challenging, if not impossible. As one member noted, attrition from initial workshops to follow-up classes was high:

> We tried to really set up our two classes. We'd have like 40 [attendees] at one and we'd have six at the other. What happened is teachers were busy. So, to come back to report in was just not something that they were able to do.

Each session presenter was asked to be responsible for arranging their own follow-ups. In many cases, presenters used Google Classroom and Google Chat to connect after the sessions or found other innovative technological solutions. For example, one presenter used Flipgrid, a software application that allows teachers to post text, artifacts of student work, or short video reflections of their implementation efforts in order to engage in follow-up dialogue with workshop participants.

Teacher leaders indicated that feedback from these follow-ups was generally positive. Armandina noted that younger or less experienced teachers recognized the impact on their teaching practice of both the workshops and the interactions with more experienced colleagues:

> From the follow-ups, we realized that the less experienced teachers were not only learning from the presenter but also from the comments given by the other attendees. Teachers were able to return to their classrooms on Monday armed with the knowledge of how to best implement the tools and strategies they had just learned.… Discussions had taken place which indicated when and why things had worked and when they hadn't.

Another ILC member said that novice teachers, whose practices were less entrenched, were often more willing to try new teaching strategies but acknowledged that in the absence of close follow-up, more experienced teachers could default to familiar practices.

In some instances, in-person follow-up was possible and successful. For example, Camie described how after presenting a session on NGSS and science pedagogy for elementary school teachers, she organized a follow-up field trip to Schmidt Ocean Institute, where teachers experienced doing scientific experiments and data collection:

> The teachers already had the [NGSS] background [from the first workshop], and then they were able to go and experience the performance tasks. We got to go on a ship and take core samples of the ocean and see the seals. It was an amazing day.

Camie explained that her objective was to give teachers the experience of conducting science experiments, noting that these hands-on experiences were critical in helping them shift their practice and provide similar experiences for their students. This, she said, was impactful for elementary school teachers, most of whom had not majored in a science discipline. She explained:

> They're a little bit afraid … but once they have the feeling [of], "Wow, I took core samples from the ocean, and now we're analyzing what was down there. This is really cool." Then they get the ah-hah [moment].… And [that] experience and excitement is what we want for our kids. Then it becomes, "OK, I can do this."

All 28 teachers who participated in her initial NGSS workshop also attended the follow-up field trip—a clear indicator of the success of this particular presentation. Nonetheless, such intensive follow-up to workshops was rare.

Despite these challenges, Armandina was sanguine about instructional shifts. She noted that change in instructional practice begins not with sweeping changes, but with small changes that teachers can build upon iteratively: "To me, if a teacher can find one takeaway from a workshop, implement it, and make it a part of their teaching practices, that's a positive change in the right direction and a win-win for both teacher and students."

Strengthening the Profession

The connection between the teacher leaders in the network and the CCT gave rise to different, yet related, professional activities. The professionals who collaborated so productively on organizing the conferences began conversations about ways to strengthen the teaching profession in the region. Two powerful initiatives emerged from these conversations: connecting teacher candidates with experienced teachers who would serve as mentors and developing a pathway toward a more diverse and supported teacher workforce. In the context of statewide teacher shortages, the immediacy of the latter need was apparent to members of the network. Thus, the teacher leaders who formed the network were able to develop discrete yet connected elements of work that allowed them to pursue projects in which they were particularly interested.

The college/university mentorship program

By inviting CSU Fullerton students to the second TTT conference, the network took advantage of the opportunity to expand its work by connecting practicing teachers and future teachers. Al and Aimee prepared for the event by reaching out to the university's Student CTA (SCTA) affiliate, asking the staff to encourage its members to attend and seeking potential volunteers to help in event organization. Aimee described their initial meeting as the catalyst for exploring opportunities for teacher mentorship:

> When the [SCTA] president met with Al and [me] to discuss that opportunity and what she would like to see, as far as the give and take, [she said] "If we provide volunteers for you, what are you going to do for us?" She suggested the mentorship program. So that came from our initial SCTA relationship.

Aimee and Al established the mentorship program shortly after the second TTT conference. The program connects CSU Fullerton undergraduate students with mentor teachers. Students sign a contract in which they agree to spend at least 20 hours conducting observations in schools and classrooms with the guidance of a mentor teacher. Aimee's goal was to make the program as flexible as possible, as well as an enriching learning experience.

> It's 20 hours of observation time. That's scheduled between [the student] and the mentor, so it can be fairly flexible. Then we also ask that, if possible, the [mentor] teacher come to Cal State Fullerton to attend some sort of SCTA event: It could be here on campus, it could be one of our community service events. Anything that will sort of get them out of the classroom and talking about other things related to teaching. We ask the student, likewise, to attend something that the teacher invites them to, like a school event or a meeting, … and then have at least a one-on-one meeting per month, so they have a chance to talk about and debrief the observation time and/or events they might attend together.

The TTT conferences provided an opportunity to develop the mentorship program, with most mentors recruited from among TTT presenters or teacher attendees. The program began in January 2016 with a first cohort of eight students and increased steadily, with 16 students and 12 mentors participating in the second semester of 2017. In its first year, both students and mentors received a small incentive for participation. In 2017, the ILC team applied for and received a National Education Association grant to support the TTT events and this mentorship program, and the

program's subsequent extension to high school students (described below) enabled the ILC team to offer scholarships. However, the program has been primarily driven by students' desire to be in schools and classrooms and have fruitful interactions with teachers, as Aimee explained:

> At the end of the semester, we try to do an event to celebrate and have the mentors come back, and have dinner, and give [the students] a certificate.
>
> The first year, I think we gave [the students] a $25 Amazon gift card. This year, we will offer scholarships because of the grant, which is nice. But that's not going to last forever, either. But most of them, they just want the opportunity to be in a classroom and meet a teacher, and work with them.

According to Aimee, the mentorship program provided valuable experiences for the undergraduate students. By shadowing a teacher for part of their day or attending events such as school board meetings or school science nights, the students got a more profound and realistic view of life in schools than they would have otherwise.

Over time, additional faculty became engaged in the mentorship program. Aimee noted:

> We also have a grant that supports future teachers called Teacher Pathway Project. That's a separate grant run by another faculty member in our Ed Leadership Program. They've been really good at connecting those students to our programs as well. So many of their students have come to Teachers Teaching Teachers. They participate in the mentorship. They're joining SCTA, so it's a great connection.

Most mentor teachers who take on this additional role do so because of a desire to give back to the profession and contribute to the education of the next generation of teachers. In teachers' busy schedules, the additional responsibilities pose considerable challenges. A mentor teacher with whom we spoke described how maintaining a program flexible enough to accommodate student and mentor schedules while still trying to make it a rich learning experience is particularly challenging. She mentored a student who seemed to need an additional push:

> I had one mentee who just sat [during class observation]. I told the mentee, "You know, you can get up, you can walk around, you can sit with the kids and talk with them and ask what they're working on." "No, I'm fine just sitting here." That was frustrating because I would have rather seen them have something where they have to interact, because just sitting doesn't help you become a teacher or know what you're doing.

Nonetheless, the increase in the number of participants and the continuation of the mentorship program to date illustrate its value. It supports the work of the CCT and increases the university's offerings at a time when enrollment in teacher education programs is decreasing nationwide. The program further strengthens the connection between the ILC North Orange County network, the university, and the SCTA. By the third TTT conference, these three organizations were listed on the TTT program as supporting institutions.

The high school mentorship program: Diversifying the teacher pipeline

The mentorship program highlighted ways in which the network was able to contribute to the profession beyond the conferences. Prior to the college mentoring program, the CCT had been participating with the American Association of Colleges for Teacher Education in an initiative designed to diversify the teaching workforce by connecting undergraduate students of color potentially interested in pursuing a teaching career with alumni of CSU Fullerton's teacher credential program.

Al and colleagues recognized that they could use their resources and connections to contribute to this initiative. Developing a mentorship program for high school students, they set out to recruit talented individuals, particularly students of color, to the profession. Establishing a professional pathway became the second major project of the ILC North Orange County network.

Research shows that although the student population in the United States is growing increasingly diverse, the teaching workforce remains predominantly White and female. In 2016–17, whereas approximately three quarters of students in California were people of color, only one third of teachers were.[91] The goal of the high school mentorship program is to strengthen and diversify the profession by attracting and recruiting high school students to teaching and targeting individuals who are underrepresented among the teaching workforce, particularly men of color. Students in the program participate in a series of education-themed workshops and tutor elementary school students under teacher supervision. Experiencing the joys (and tribulations) of teaching, the high school students might look forward to attending college and becoming teachers. At the same time, the elementary school students gain support and benefit from much-needed additional learning opportunities if they are at risk of falling behind in their studies.

A member of the network described the program's vision to diversify the profession as follows:

> That's the way that we encourage more people to go into the profession. If you're mentored by somebody who understands your background and understands your needs, you have a stronger bond. So as much as possible, try to look at the benefits of having mentors that are not just 50-year-old White women. Not to say that my contributions aren't important, but [the goal is] finding those outliers and then bringing them into the fold … so that it's not an anomaly to have a Black elementary teacher at Orange County.… It's a dream that this become just the norm.… That's the vision that's kind of been planted.

In establishing the program routines, the group encountered several administrative barriers, such as liability insurance. Leaders and members realized they needed partners who could provide support and resources. A relationship with the North Orange County Regional Occupational Program resulted in the program being run in partnership with this organization. Through connections formed at ILC project meetings, an ILC member in Ventura County who partnered with a local city council started a parallel program. At the time of this research, approximately 100 students from Ventura County and Orange County were part of the third cohort of the high school mentorship program. ILC teacher leaders worked as mentors for the teachers of participating students. All the students participated in end-of-the-year celebrations held at CSU Fullerton. After securing a grant from the National Education Association, the group was able to offer $500 scholarships to participating students who continue their studies at a college or university. Leaders of this project hope that graduates of the program who attend college will continue to be involved in mentoring programs and will partner with students in a credential program to sustain those students' interest in teaching.

A logic model for building and widening the pipeline for teacher leaders

Inspired by the early success of the two pilot initiatives—the college/university mentorship program and the high school mentorship program—Al and his colleagues realized that by connecting the items on their menu of activities they were addressing some of the most obstinate problems facing the teaching profession. Through their efforts to recruit candidates of color to teaching, by offering consistent mentorship to teacher candidates and professional learning workshops to experienced teachers, and by forming collegial networks, ILC teacher leaders were making significant contributions to the profession along its continuum. In essence, they were striving to build and to widen a pipeline for professionals—from potential to aspiring, emerging, professional, accomplished, and finally, teacher leader.

As the college/university and the high school mentorship programs completed successful pilots, members of the network felt that their investment of time and effort in the professional development of teachers was valuable. They also yearned to stimulate and bring about systemic change, as an ILC member commented:

> We realized professional development is really important, but teachers are getting a lot of it.... If we want to change education and support, we need to have more than just a professional development model. I'm not saying a professional development model is not important; I'm saying that Teachers Teaching Teachers wants to look at the whole package. So the goal is this: From TK to 12 and beyond, we want teachers invested in education. We want kids to feel supported, teachers to feel supported, pre-service teachers to feel supported.

Al and his colleagues presented their plans as part of a project for a Teach to Lead conference held in New Orleans in 2016. A joint project of the U.S. Department of Education and ASCD, Teach to Lead is an organization that promotes teacher leadership and the sharing of educator practices through teacher summits. It also supports Leadership Labs, daylong meetings in which educators work to progress action plans, including the elaboration of logic models presented at Teach to Lead summits. Al and the team hosted another of these meetings later that year, this time in California, in which they developed and solidified their ideas further. They continue their work through the Fullerton Leadership Lab under the title Cultivating Teacher Leaders.

In a multitiered approach, the Cultivating Teacher Leaders project offers a model for strengthening and diversifying the teaching workforce along the continuum from high school mentorships to National Board certification. (See Figure 12.) It is still early in its development, but with the additional tiers, designed to both lead into and follow from the mentorship programs (Tiers 2 and 3), it sets out the group's long-term vision. The model includes an at-risk tier (Tier 1), with a prevention program for transitional kindergarten to 6th grade and an intervention program for grades 7–12. These two programs seek to build academic and social-emotional skills and to promote positive behavior. The network started discussion in 2017 with the Orange County Office of Education about offering these programs.

Figure 12
ILC North Orange County "Cultivating Teacher Leaders" Logic Model

Source: Documents provided by members of the ILC North Orange County network.

Tier 4 is the teacher induction program and follows graduation from a teacher initial education program. It proposes to pair beginning teachers with mentors to prevent early-career attrition. Tier 5 is teacher professional development and consists of the growing and highly successful twice-yearly, teacher-led professional learning conferences. The National Board certification tier (Tier 6) proposes to support teachers as they pursue National Board certification and to train a cadre of local nationally certified teachers to serve as their mentors.

The logic model and exploration of additional programs to strengthen and diversify the teacher workforce highlight the potential—as well as the desire—for teacher leaders to be involved in shaping and strengthening the profession.

A Teacher-Led Professional Network Takes Root in North Orange County

The TTT conferences served as a hub for teacher leaders to network. Al and the ILC North Orange County network gained considerable visibility and recognition not only in their region, but also statewide and even nationwide, for the conferences and the ambitious initiatives that emerged from them. This visibility enabled the network to partner with other local and community organizations for resources and support.

Teacher networks: A professional resource

For ILC North Orange County, the TTT conferences were a catalyst for forming a teacher network that could serve as a resource for teacher leaders and current teachers, as well as for undergraduate and credential students. As Aimee noted, "If every teacher mentored one future teacher, imagine the impact that could make." For Aimee, establishing connections with teachers and teacher leaders at TTT events was just as important as the instructional strategies presented and learned. She commented:

> There are really great, experienced teachers at these events, especially the ones who are presenting, and they [in turn] have a network of folks.... The better [future teachers'] relationships are with current teachers, I think the easier it is for them once they become a teacher and have their own classrooms.... They're probably more likely to stay in the profession if they have a network of folks who support them, even before they start the credential program. That was one of the reasons we wanted to start the mentorship program.

Many participating teachers came from the districts where the credential program students would go on to teach after graduating. Thus, networking was one way these future teachers could learn about the experience of teaching in these communities. Aimee hoped that they would gain valuable knowledge about the context of teaching in the different communities before graduating and entering the classroom and learn how to navigate and adapt tools to be effective teachers in them:

> I think just the networking is probably the biggest thing for me, personally, because they're learning about the community sooner than later. Many of them really won't connect to a classroom or get much hands-on experience until they're in one of our prerequisite courses, ... but you're [still] only getting about 45 to 60 hours of classroom experience with that. And then you go into your credential program, and your student teaching happens. It's not a ton of experience in a classroom before you're an actual teacher, so I think the more involved they are with the community and school districts and teachers, the better off they'll be in the long run.

The network was also generative for members in other areas. For example, one member, having participated in TTT events, subsequently established a similar network in a district in Riverside County. Al characterized this expansion as central to the value of the network. By building strong personal relationships, sharing stories, and exchanging ideas, teacher leaders could connect colleagues with others who could help extend the professional learning work.

Al added that being able to call upon the knowledge and the expertise of colleagues within the network was an important professional resource. It allowed him to offer advice and support to other ILC teams beyond the scope of his own professional knowledge:

> I know who I can call to connect people to if they want to do something. If you want to do something for National Board, I'm going to connect you to [a National Board–certified colleague] because she's been doing it in Orange County for the past 10 years. If you want to do something with curriculum compacting, I'm going to connect you to this. If you want to do something strength based, I can connect you with this. It's just about building the network and connecting people.

Networks as overlapping communities

Evidence that ILC North Orange County was taking root also came from the fact that its members, like many other teachers, are active in multiple professional organizations. Some are part of the CTA, such as the CTA state council and CTA's nonprofit Institute for Teaching. Some members belong to discipline-based organizations, such as the Orange County Math Council. Members of the ILC North Orange County network successfully petitioned to form their own Orange County Regional Think Tank of the Institute for Teaching, giving teacher leaders a further forum to share ideas and address problems of practice.[92]

Thus, the network represents a series of distinct but overlapping professional communities, allowing for the exchange of ideas and the leveraging of resources. For example, in developing their ideas about how to diversify the teaching workforce, Aimee and Al were able to apply for grants supporting Hispanic-Serving Institutions because of Aimee's position as Director of the CCT at the university. A similar network was established in Riverside County with the support of several ILC members.

Within the network, members could pursue their particular projects and form interest groups: Camie described how the network gave teacher leaders room to pursue their passion:

> We sit in a room and we say, "OK, if you're interested in induction, go over there. If you're interested in being supported in trying to be a National Board–certified teacher, go over there. If you want to plan the teacher professional development, go over here." So nobody says, "You do this." We sit and we plan and then we make it happen. Which is really kind of cool.

Belonging to a professional network dedicated to teacher learning facilitates the development of mutual trust and enduring personal relationships. Camie described how this happens:

> We spend time together. We eat together, we drink together, we cry together, we put our heads together and try to figure out what to do. We FaceTime each other. We're all crazy busy in our own areas of life, but we come together because we find joy in

> it, that's why. We find joy in this crazy, crazy journey of [finding a door that's closed] and then finding another one that's open. Now there [are] so many open.... We all have the same common goal: We all care about kids and we all care about teachers, and so we are willing to invest the time.

Teacher learning and leadership development

The experience of participating in the ILC and in the North Orange County network conferred further professional and personal benefits for ILC members. Collaborating to lead PDWs deepened teacher leaders' own understanding of CCSS and instructional shifts. Armandina explained:

> The work that I've been doing with ILC has really helped me grow as a professional [and helped] my [students] grow, and then when I'm doing PD, I help other teachers understand what the Common Core is. It's not just integrating one or two lessons that are Common Core-ish, but it's helping the kids make all these connections and see how it applies to the real world.

Al credited the ILC with establishing a structure that promoted and nurtured teacher leadership. Providing professional development in a variety of forums raised the profile of members of the North Orange County network. "Really everybody had a chance to elevate from where they were because of CTA, because of SCOPE, because of [the] opportunity network," he acknowledged.

In a subsequent correspondence, Armandina provided an example of how she had incorporated some of these new learnings into her own teaching. She described how she changed her language and had students reflect on their learning growth so that she could address her students' mathematical mindsets:

> Since learning of the work of Jo Boaler on growth mindset [in mathematics], I emphasized to my students that every failure was a learning opportunity. I would tell them that we are all somewhere on the learning continuum and our goal is to continue to move forward by making small changes and reflecting and learning from our mistakes. With this, students soon came to realize that they were capable of learning mathematics, which helped them gain a new sense of confidence in their mathematical abilities.

Karin, an ILC colleague, described Genius Hour, an idea drawn from technology companies such as Google, in which classroom time is set aside for students to pursue projects they are passionate about. In leading sessions about Genius Hour for students, Karin realized that teachers, too, were passionate about topics and projects. She formed Genius Hour groups to foster shared learning and collaborative, teacher-led research, which became a way for "teachers to take back control of their own learning."

In some instances, involvement in the network advanced its members' careers. For example, through professional connections, one ILC North Orange County member was drafted onto the national board of an organization that leads professional learning in education technology. Another recounted how involvement with the network led to her participation on a state science implementation and review committee. A third member indicated that the experience of providing professional development through the ILC project led her to a position of teacher educator.

Involvement in the ILC and in the North Orange County network also revitalized members' passion for teaching and supporting colleagues. One teacher leader expressed it as follows:

> I haven't always been that way. I've been one of those guarded teachers.... [But now] if we have something, we share it, we find something else that we can share again. So to me, the ILC has really empowered me to do that more. I've done it more as an ILC member than ever before.

Camie added that after many years in teaching, it was this renewed sense of collegiality, purpose, and common mission that kept her engaged:

> We're very diverse people. But we like each other, and we have a love for this work. And if we just stayed in our little compartments and talked, I don't think any of us would be happy. I would probably be retired.

Camie's comment is also resonant with considerable education research literature showing that collaborative working conditions contribute to teacher retention.[93] In the context of teacher shortages in California and nationwide, the prospect of retaining experienced educators who can support and mentor colleagues holds important potential.

ILC member Robert Bassett recognized that being part of the statewide and local networks had contributed to his professional identity as a teacher leader:

> I've always been at the forefront of a teacher leadership role. But what really taught me what a teacher leader really truly is, is the Instructional Leadership Corps. It was different because it was all colleagues. I'm sitting there, with my colleagues, sharing my unique notes ... and then they show me something of theirs.... It's different because it's collegial. It doesn't have a hierarchy.... We're holding each other up, and we're creating great interrelated professional, personal [relationships], and just everything you can imagine. I've met such incredible people through ILC, [people with whom] I really have long-lasting bonds and professional and personal ties.... To me, it was the impetus to realizing what true teacher leadership is.

Time is a perennial challenge for teachers in general, and even more so for teacher leaders who take on responsibilities and tasks beyond their work in the classroom. The myriad tasks of members in the network related to organizing the TTT conferences, planning and presenting professional development workshops, mentoring students, and supporting initiatives of network members required considerable time. Members described working late hours and on weekends to accomplish it all. Additional teacher leaders were unable to join the network because of lack of time. Aimee described it as follows:

> Teachers are overworked as it is. And underpaid. So, I think that's the hard part. And that's why not everybody was probably interested in joining something like the ILC. [Although] it's a good idea, it's helpful, it's good for their careers, it's good for their education, their lifelong learning. All of those things that you want a teacher to do. It's still something they have to volunteer to do. Their extra time, you know.

Another member explained that there was not sufficient time available to do the development and planning necessary to deliver high-quality workshops on new instructional strategies. Nonetheless, she felt that being a full-time teacher kept her grounded in the work:

> I think the biggest challenge is having time to put PD together.... I don't want to leave the classroom, but I wish I had a day a week where I could be a support provider as a classroom teacher to teachers.

With lack of time and scarce funds available, a further challenge was keeping members invested in the work. One member commented that at the beginning of a program there was a lot of enthusiasm, but that sustaining that interest turned out to be difficult, echoing findings from research on networks.[94]

Members of the network were cognizant that maintaining strong buy-in from members was important as their work expanded from the TTT conferences and mentorship programs to other elements of the logic model and to other locations. Their concerns were mitigated by the strong personal relationships developed through their activities. Al and Aimee were hopeful that attracting grants to support the work could help in the short term but recognized that it took one or more individuals to lead each effort and ensure the activities were sustained and could achieve their potential.

Teacher Learning Continued

In a follow-up conversation in 2019, teacher leader Al Rabanera shared how he and the other members of the network continue their work to strengthen and diversify the pool of teachers in their region. Through its ongoing partnership with CSU Fullerton's Center for Careers in Teaching, the network conducts two conferences per year, attended by early-career teachers and teacher candidates. To deepen the partnership further, ILC members are planning to offer monthly professional learning sessions for undergraduates who are aspiring educators and interested in studying for a teaching credential.

Several members of the network continue to mentor early-career teachers under the auspices of a pilot program that is part of the CTA's Institute for Teaching. The program had received a significant grant and book resources from the National Education Association and is also supported by the CTA. The network is seeking to expand its pipeline model to recruit education support professionals and para-educators who want to become teachers.

According to Al, a focus of the network's efforts was on developing institutional relationships to support sustainability:

> The whole intent of the grant funding is sustainability through partnerships, joint venture agreements, MOUs [memoranda of understanding] working through unions, unions with school districts, and then nonprofits and community partners.

Al noted that due to the trusting relationships built among members and partners of the network since its inception nearly 5 years ago, the North Orange County ILC network is now able to leverage these relationships to serve as a resource to other teachers and ILC teams.

Key Takeaways

The North Orange County network of teacher leaders is a nascent alliance that emerged in response to ILC members' offerings of professional learning opportunities for their colleagues in their home districts. The flexible and generative nature of the network highlights how initiatives for teacher leadership can lead to outcomes extending beyond their initial design. Key takeaways include:

ILC leaders in North Orange County were able to expand their reach by collaborating to find new ways to serve the needs of the teaching profession in their locales. They broadened their efforts beyond the initial charge of the ILC to explore solutions to key challenges facing the teaching profession, such as: (1) Teachers Teaching Teachers conferences, which have grown steadily over the past 4 years and have become a regular feature of the CSU Fullerton College of Education calendar; (2) college/university and high school mentorship programs for prospective teacher candidates to strengthen and diversify the profession; and (3) a teacher professional network to serve as resources for one another. Sustaining the network became an explicit aim of the conferences and mentorship programs.

Teacher leaders developed institutional relationships for mutual benefit. They built an enduring relationship with the Center for Careers in Teaching at CSU Fullerton; partnered with regional, state, and national teachers associations; and secured financial resources from the National Education Association. They developed a North Orange County think tank under the auspices of the CTA's Institute for Teaching.

ILC members developed leadership skills and a sense of efficacy. Teacher leaders contributed to conferences, engaged in mentorship, and provided PDWs in their home districts. They developed leadership skills through teaching and supporting colleagues and had a positive impact beyond their classrooms and schools. Some of them extended their formal roles, their professional responsibilities, and sense of purpose.

Time for collaboration and support remains a key need for sustainability. Teacher leaders spent many hours outside of their formal responsibilities in planning, leading, and supporting initiatives of the network. Sustained follow-up from the conference format was challenging. As is the case in any professional collaboration, time is a key variable.

Chapter VI: Lessons Learned

The transition to the Common Core State Standards (CCSS) has been a lengthy and challenging process for California school districts. These standards emphasize conceptual understanding and problem-solving, which require significant changes in classroom instruction. Teachers realize that classrooms that include students with a wide range of previous academic achievement, varying levels of English proficiency, and different interests and learning needs pose complicated pedagogical challenges. They also recognize the importance of well-grounded strategies and complex approaches to face these challenges.

The ILC project has provided a necessary infrastructure and conceptual coherence during this period of transition. It instigated opportunities for professional development of new teacher leaders, thereby further increasing implementation capacity. Continued development of the project can build on the solid base created to date. The ILC can inform efforts to build professional capacity for the implementation of the CCSS and the Next Generation Science Standards (NGSS) not only in California, but in other states as well.

The lessons learned will help inform and shape similar efforts going forward. Importantly, ILC leaders' efforts focused on students: more and deeper interactions, increased oral and written proficiency in the language of instruction, use of multiple strategies for mathematics problem-solving, and engagement in science and engineering practices.

Below we present five central lessons that emerged from the findings of this research.

1. Teachers value professional learning led by their colleagues.

When ILC workshops are contrasted with traditional professional development offered by outside consultants, teachers prefer learning from and with their colleagues. They recognize and trust their colleagues' knowledge and experience. Teacher leaders develop professional learning that is attentive to local needs and attuned to the specific challenges district teachers face in implementing the new state standards and assessments. ILC teacher leaders who work in the same district are also more accessible for follow-up questions, advice, and support.

The teachers with whom we spoke recognize that their colleagues are responsive to and knowledgeable about the shared context and the educational needs of their students and can demonstrate, not only describe, recommended instructional shifts.

The ILC teacher leaders shared with us their excitement and commitment to the work. They also expressed their desire to expand the work, reach more teachers, and provide more extensive support to their colleagues. The ILC demonstrated success in elevating teachers' understanding of the new standards and assessments, presenting instructional strategies that support students' learning, and developing teacher leadership. ILC teacher leaders and their colleagues, as well as site administrators, described increased student engagement as a main effect of the CCSS- and NGSS-aligned curricula and the changing patterns of interactions in the classroom.

2. ILC membership enhances teacher leaders' professionalism and sense of efficacy.

Beyond the impact on teachers' work in their home districts, creating and leading professional learning for colleagues is highly beneficial for the ILC teacher leaders. Realizing that they are helping to shape other teachers' practice increases their sense of professional efficacy. They are able to broaden their professional reach beyond their classrooms and thus amplify their leadership skills as they initiate innovative activities and solidify professional relationships.

ILC members we spoke with are proud of their work and accomplishments. As one member put it, "We all feel really good about the work we're doing, and here's the thing: If it weren't for us, I don't think this work would be getting done."

Empowering the profession was a frequent theme in the teacher interviews. An ILC teacher leader said it best: "In the end, that's one of the main reasons why the ILC really attracted me—because [it's] the idea of empowering teachers to do something to improve their own professional practice."

3. Supportive structural arrangements foster instructional change.

The curricular and pedagogical shifts that adoption of the CCSS and the NGSS required were ambitious, profound, and demanding. Moving from scripted curriculum and pacing guides to planning lessons with engaging learning activities was neither quick nor effortless.

Successful and sustained change in instructional practice requires awareness and involvement from school and district administrators. Their role in allocating resources and acting as instructional leaders means that, as one teacher noted, "If it isn't a priority for principals, it won't happen."

Under the new paradigm of CCSS and NGSS, site-level administrators need to play very different roles from what was customary under the approach of previous programs such as Explicit Direct Instruction. Including greater administrator involvement in instructional change is an aim of the ILC going forward. The ILC has increased the number of administrators as members, aided by the fact that many ILC teacher leaders move into roles with the district, owing in part to the success they achieve with the ILC. To align with more student-centered learning and sustain changes in instruction, administrators need to shift how they conduct classroom observations and provide formative feedback as well as performance evaluations to teachers.

A key structural change in districts in which the ILC is active is the granting of time and opportunity for professional collaboration. Time is one of the most critical resources for shaping teaching practice. ILC teachers and their colleagues need time and material resources for sustained collaboration. Together they need to plan lessons, observe each other's classrooms, analyze the work of their students, and discuss and reflect together on their experiences. We found that teachers have more opportunities to do so when district- and school-level administrators provide resources and build structures that support collegial collaboration. When ILC teams can initiate systemwide structural changes, they create conditions for the project to take root in their locale.

When PDWs became integrated with the districts' professional development calendars, they became institutionalized and part of routine district activities. As such, the ILC activities became legitimate district offerings and could gain access to and benefit from regular district resources.

4. Systematic follow-up contributes to implementation of instructional shifts.

Achieving depth versus reach is a perennial dilemma in teacher professional learning initiatives. We observed that lasting changes in pedagogy are more likely when teachers have the opportunity to try out new strategies, receive feedback, address challenges in implementation, and iteratively improve over the course of multiple workshops, with advisors and coaches at hand. We observed teams grapple with the question of how to reach a large enough number of teachers to adapt content to the new standards while still providing the kind of close support associated with meaningful changes in pedagogy.

Frequency and quality of the follow-up opportunities are variable yet indispensable. Follow-up usually consists of teacher self-reports; verbal or written reflections with colleagues; and, sometimes, samples of student work. Follow-up that involves either the modeling of teaching practices in the classroom by ILC teacher leaders or observation and feedback of participant teachers trying out the instructional strategies is rare but important. Designing for long-range engagement and follow-up is a key element of lasting change and should be part of initial plans, so that the many benefits of teacher-led professional development can be secured.

5. Strategic relationships support deep, widespread professional learning.

ILC teacher leaders get greatest traction when they are able to build relationships with district administrators, teachers associations, county offices of education, universities, and philanthropic organizations. Partnerships with county and district offices, universities, and funding sources support content alignment and leverage financial and logistical resources at the local level.

For example, our case studies show that as mutually trusting relationships developed, districts and teachers associations were increasingly willing to contribute resources. Contributions took different forms: direct financial resources such as stipends for presenters and participants, meals for participants (valuable for after-school workshops), and release time for ILC leaders.

We found that ILC teams are more successful when teacher leaders are able to connect to organizations and institutions that recognize the inherent value of their work and are willing and able to provide support and resources. Maintaining these connections and establishing productive relationships are necessary for project continuation and institutionalization.

Teacher leaders selected for the project brought with them extensive classroom experience, a commitment to improve students' learning, and a dedication and desire to strengthen the profession. Their professional expertise, their credibility, and their perceived legitimacy to offer high-quality professional learning were central to the successful outcomes of their activities. This was particularly important in the early phases of the project, as teacher leaders approached districts and other partners to offer themselves as providers of professional learning, something previously uncommon in many districts.

The Foundational Support of ILC's Institutional Partners

The ILC partnership of the Stanford Center for Opportunity Policy in Education (SCOPE), the National Board Resource Center (NBRC), and the California Teachers Association (CTA) has been and continues to be indispensable. These partners provide ongoing guidance and support, access to intellectual and academic resources, sustained professional interactions, upkeep of the professional network, and personal recognition. Teachers with whom we spoke recognized the value of the productive collaboration among the three organizations.

The current and future teacher leaders need to continue to learn as they teach their colleagues. They need to continue to develop and refine their knowledge in additional domains and aspects of teaching as ever-new issues surface. Providing learning opportunities and organizing structured professional encounters among them and for them are essential for the growth and the strength of the network. The existence of a solid organization that continues to guide and support, document, and assess its outcomes is vital for the continued success of the ILC project.

Conclusion

Our study of the four sites demonstrated the ILC's success in elevating teachers' understanding of the new standards and assessments, presenting instructional strategies to support students' learning, and developing teacher leadership. When teachers used more active strategies, students were more engaged and approached learning with excitement. Teachers with whom we spoke recognized the value of the productive collaboration among the three organizations that introduced and supported the ILC and provided the framework, resources, and scholarly expertise. At the local level, partnerships with county and district offices, universities, and funding sources can align content and leverage financial and logistical resources.

To transform classroom practice, it is imperative to effect change in the local systems. The significant investment of financial resources, effort, and time produced professional and personal rewards for the ILC teacher leaders and the teachers who participated in the large- and small-scale activities. Importantly, the many teachers reached by the project reaffirmed and recommitted to their chosen profession.

The ILC's pathbreaking design provides a solid template for offering professional learning opportunities for teachers and other educators. With continued support, it will continue to succeed in deepening teachers' knowledge of the new standards and assessments as well as the instructional capacity needed to support students in meeting the standards. The growth and development of local teacher leadership strengthens the profession.

Appendix A: Model for Professional Development Sequence

For Teachers: Essential PD Workshop Components

Each PDW for teachers should model an instructional shift within a subject area. You may want to use the Planning Your Professional Development Workshop Session I document to assist with the planning of Session I.

Session I should have the following 8 components woven into its design:

1. Choose the instructional shift you will demonstrate in Session I.
2. Use the Planning your Professional Development Workshop Session I document as a set of planning principles for designing an experience of the instructional shift (e.g., participate in a Number Talk, practice providing "stronger and clearer" responses; or engage in a scientific argument) that you will model for participating teachers.
3. Lead participating teachers through an experience of this instructional shift.
4. Give participating teachers a concrete example of what occurs when students learn content with this instructional approach (e.g., watch a video of students participating in a Number Talk; examine samples of student work associated with this instruction).
5. Using the Instructional Thinking: Considering the Four Domains document, facilitate a conversation about how well the lesson that participating teachers just experienced attended to these 4 domains. Discuss what else would need to occur to enact this instructional shift in their individual classrooms.
6. Ask participating teachers to consider their own teaching context. Where do their students particularly struggle? How well does this particular instructional shift address what their students are struggling to do? If not very well, what instructional shift/move would better meet their students' needs?
7. Ask participating teachers to select an instructional shift to try out in their own classrooms. Have attending teachers use the Selecting and Using an Instructional Shift in My Classroom document to plan to teach the selected instructional shift in their classroom.
8. Facilitate a conversation among attending teachers about what artifacts of student learning they can bring back to Session II to see what happened as a result of trying out this particular instructional shift in the classroom.

Between sessions, consider how you will have attending teachers examine and discuss the artifacts of student learning that they bring back to Session II. What do you want teachers to learn from this experience? How will you support teachers to design their next instructional move as a result of looking at the resulting student work? The Session II workshop should focus on sharing of artifacts and choosing another instructional shift to try. Refer to page 2 of the ILC Project Description for additional guidance regarding the purpose of and activities for Session II.

For Site-Based Leaders: Essential PD Workshop Components

If you are designing a PDW for principals or other site leaders about how to grow school conditions to support teachers' learning and cultivate teacher leadership in the design and implementation of effective CCSS/NGSS instruction, your Session I should have the following components:

1. An experience with a Smarter Balanced Assessment task item and/or an instructional shift and the student work that results. Make sense of the experience through a discussion:
    a. What do the CCSS/NGSS require students to know and be able to do?
    b. What do the CCSS/NGSS necessarily require teachers to know and be able to do?
    c. What site conditions are needed to support teachers to enact instruction that will support students in achieving the Common Core and Next Generation Science standards? (Consider using the Instructional Thinking: Considering the Four Domains document to aid this conversation.)
2. Provide a concrete example of what occurs when teachers are supported to try out new instructional approaches, such as by reading Instructional Capacity: How to Build it Right.
    a. In conversation, generate a list of leadership moves (and shifts in leaders' thinking) that will be needed to create these conditions in our schools;
    b. Consider how these leadership moves will grow the site conditions needed for continuous instructional improvement.
3. Ask site-based leaders to identify a leadership move to try out at their workplace (e.g., the weekly staff meeting or a grade-level team meeting). Consider:
    a. What are teachers in the workplace struggling to do?
    b. How will this particular leadership move support teachers' learning and cultivate teacher leadership?
4. Have site-based leaders consider what artifacts from this experience (e.g., samples of teacher work) they could bring back to Session II.

For Session II, consider:

- How will site-based leaders collaboratively examine their artifacts?
- If site-based leaders bring a teacher who experienced their leadership move to Session II, how can you help the group learn from these teachers?
- Did the leadership move(s) support developing instructional practice and/or teacher leadership? What do you see that makes you think so? If not, why not?
- How will you support site-based leaders to design their next leadership move in order to continue to develop site conditions conducive to learning?

Appendix B: Madera USD ILC Workshops: Sample Resources for Teachers

Language Strategies for Active Classroom Participation

Expressing an Opinion
I think/believe that . . .
In my opinion . . .
Based on my experience, I think . .

Predicting
I predict/imagine that . . .
Based on . . ., I infer that . . .
I hypothesize that . . .

Asking for Clarification
What do you mean?
Will you explain that again?
I have a question about that.

Paraphrasing
So you are saying that . . .
In other words, you think . . .
What I hear you saying is . . .

Soliciting a Response
What do you think?
We haven't heard from you yet.
Do you agree?
What answer did you get?

Acknowledging Ideas
My idea is similar to/related to _____'s idea.
I agree with (a person) that . . .
My idea builds upon _____'s idea.

Reporting a Partner's Idea
_____ indicated that . . .
_____ pointed out to me that . . .
_____ emphasized that . . .
_____ concluded that . . .

Reporting a Group's Idea
We decided/agreed that . . .
We concluded that . . .
Our group sees it differently.
We had a different approach.

Disagreeing
I don't agree with you because . . .
I got a different answer than you.
I see it another way.

Offering a Suggestion
Maybe we could . . .
What if we . . .
Here's something we might try.

Affirming
That's an interesting idea.
I hadn't thought of that.
I see what you mean.

Holding the Floor
As I was saying ...
If I could finish my thought...
What I was trying to say was...

(Kate Kinsella, San Francisco State University, 6/07)

Appendix C: Inaugural *Teachers Teaching Teachers* Conference Sessions, May 2015

BREAKOUT 1

Session Descriptions

Session Title: How to Align/Revise Old Science Curriculum Lessons to Next Generation Science Standards (NGSS) using Inquiry-Based Curriculum Lessons
Presenters: Pia VanMeter - Martin Luther King HS, Riverside Unified School District
Ashley Bettas-Alcala - Riley Elementary School, San Bernardino Unified School District
Session Description: Introduction of the NGSS focusing on the shifts needed to increase engagement in science and engineering practices including meeting and presenting the performance expectations. The session will include hands-on manipulation of old science curriculum in physical and biological science to an inquiry-based lessons and alignment of the lessons to the NGSS.
Target Grade Level: TK-6

Session Title: Unlocking Text Complexity Using Socratic Seminars and Critical Thinking
Presenters: Summer Peterson - Diego Valley Charter School, Julian School District
Paula Lempert - SIATech Charter High School, Vista Unified School District
Session Description: Learn how to facilitate Socratic Seminars in a way that puts the onus of learning and thinking on the students. Additionally, learn how to guide students in critical thinking during these discussions. You will get a chance to try the activities and will be given materials that you can use to implement these activities in your own classes.
Target Grade Level: K-12

Session Title: Technology In The Math Classroom
Presenters: Jason Chong - Parks Junior High School, Fullerton School District
Session Description: Technology tools that are engaging and effective for lessons and the classroom. Come and investigate apps and websites (kahoot, padlet, geogebra, plickers, robertkaplinsky.com, etc) that will aid in lesson design and classroom engagement.
Target Grade Level: TK - Middle

Session Title: Getting Started with STEM by Introducing Engineering in the TK-12th Grade Classroom
Presenter: Karin Barone, NBCT - La Veta Elementary School, Orange Unified School District
Session Description: Engineering is the natural place to start with STEM and get a jump start on the Next Generation Science Standards (NGSS). This workshop will provide easy to implement strategies to get K-6th grade teachers started with engineering and plenty of sample project ideas to take back to school and share with your colleagues.
Target Grade Level: TK – 6

Session Title: Using Textual Evidence to Support a Claim
Presenters: Victoria Curtis - Vista Visions Academy - Vista Unified School District
Session Description: Learn strategies to help students support their ideas with evidence. Focuses on Listening/Speaking and Writing skills. Great for ELs (and all students).
Target Grade Level: 3-12

Session Title: Defending Your Argument
Presenters: Theresa Buggage - Canyon Springs High School, Moreno Valley Unified School District
Raúl Miranda - Great Oak High School, Temecula Valley Unified School District
Session Description: Focus on student learning through CCSS and NGSS Instructional Shifts. Use marking the text strategies as a starting point for deeper learning activities that address all DOK levels. Strategies include numbering paragraphs, chunking text to read, and charting in the margins to define an author's claim and defend arguments.
Target Grade Level: K-12

BREAKOUT 2

Session Title: Getting on the Right Track: Investigating Instructional Shifts
Presenters: Leslee Milch, NBCT - Gilbert Elementary, Buena Park School District
Jenny Hitchcock Ed.D. - James Guinn Elementary, Anaheim City School District
Session Description: Zoom in on listening, speaking and academic language via CCSS Instructional Shifts and connect with the ELA Claims to take away instructional strategies to immediately implement in your classroom.
Target Grade Level: K-8

Session Title: Number Talks and Cognitively Guided Instruction in Math
Presenters: Sergio Gomez - Miramonte Elementary, El Monte Unified School District
Kirsten Robinson, Ed.D. - Lindstrom Elementary, Bellflower Unified School District
Session Description: Practitioners will walk away with: concrete knowledge, working samples and a clear understanding of what "Number Talks" are and how they can be implemented daily with nominal prep and minimal materials. "Number Talks" aid in building both "flexible" thinking as well as math fluency.
Target Grade Level: TK-6

Session Title: From At-Risk to At-Promise: Engaging Struggling Students
Presenters: Allison Carey - ACCESS Institutions - Orange County Department of Education
Al Rabanera, Ed.D. - La Vista High School - Fullerton Joint Union High School District
Session Description: Having trouble engaging your students? Do your students lack motivation? Participate in a session that will develop your students' critical thinking skills in ELA and Math while targeting the CCSS.
Target Grade Level: High School

Session Title: Claims, Evidence and Argumentation in Science
Presenters: Donna Markey, NBCT - Vista Visions Academy - Vista Unified School District
Catherine Sanchez, Kolb Middle School, Rialto Unified School District
Session Description: What is a Claim? How do students find Evidence? What is Argumentation in Science? Attend this session to find the answers to these questions and more! We will work through 6 water activities that use common materials that can be adapted to any age group. You will get lesson plans and sentence frames to implement these activities in your own classes.
Target Grade Level: K-12

Session Title: Finding Relevance in Real-Life Nonfiction Text
Presenter(s): Tricia Hyun, Ed.D. - Parks Junior High School, Fullerton School District
Session Description: We have seen the words "relevant" and "real-life" stamped across the Common Core State Standards, but what is "relevant" and what is "real-life"? In this session, teachers will take 3 real-life topics that are relevant to the real world, and be able to use the 3 English language arts lessons in their classrooms the very next week.
Target Grade Level: 6-10

Endnotes

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