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Improvement Science in Teacher Preparation at California State University

**How teacher preparation
partnerships are building
capacity to learn to improve**

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The New Generation of Educators Initiative (NGEI) at California State University (CSU), funded by the S. D. Bechtel, Jr. Foundation, seeks to strengthen the current teacher preparation system in California so that new teachers enter the workforce prepared to implement Common Core State Standards (CCSS) and Next Generation Science Standards (NGSS). From January 2015 through June 2019, NGEI is providing grants to CSU campuses and their district partners to improve their teacher preparation programs. The Foundation has developed a theory of action to guide reform that focuses on five Key Transformation Elements: partnership, prioritized skills, practice-based clinical preparation, formative feedback on prioritized skills, and data-driven continuous improvement.

WestEd and SRI International are conducting a formative evaluation of NGEI implementation and outcomes at the grantee sites, as well as delivering technical assistance to strategically support data-driven program reform efforts.

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Introduction

One of the most pressing educational problems in the United States is improving the quality of teacher preparation (Goldhaber, Liddle, & Theobald, 2013; National Academy of Sciences, National Academy of Engineering, & Institute of Medicine, 2007). Over the last decade the education sector has begun to learn from other sectors — especially health care — about the potential power of improvement science as an approach to improving the quality and reliability of educational systems (Bryk, Gomez, Grunow, & LeMahieu, 2015; Coburn, Penuel, & Geil, 2013; Lewis, 2015). Evidence from an effort to improve how beginning teachers are supported in three large urban districts through development and testing of feedback systems demonstrates the promise of improvement science methods for tackling persistent challenges in teaching (Hannan, Russell, Takahashi, & Park, 2015).

This Innovation Highlight describes a network-based effort — the New Generation of Educators Initiative (NGEI), funded by the S.D. Bechtel, Jr. Foundation — that applies the principles and methods of improvement science (Langley, Moen, Nolan, Nolan, Norman, & Provost, 2009) to the challenge of improving how new teachers are prepared in the California State University System. The initiative emphasizes data-driven, continuous improvement by funding teacher preparation programs to routinely collect and analyze the data needed to monitor teacher candidates' progress toward competency in prioritized skills and to use the results of that analysis to (a) inform clinical support and teaching during the school year and (b) identify meaningful programmatic changes.

The NGEI-funded teacher preparation programs also receive support from WestEd and SRI, which have developed a multipronged technical assistance strategy that is informed by improvement science. The technical assistance includes in-person trainings, cross-site webinars, monthly coaching calls with each site, annual convenings, and occasional site visits.

The first section of this Innovation Highlight explains the theory of improvement science and how approaches that are informed by improvement science differ from other improvement efforts. The second section describes how NGEI has put this theory into practice through improvement science technical assistance for the NGEI grantees. Examples from the NGEI grantees are included throughout to illustrate how improvement science principles have been applied in the teacher preparation context.

Improvement Science: An Organizational Learning Approach to Improving Teacher Preparation

There are several potential approaches to improving teacher preparation programs, none of them mutually exclusive. One approach is to invest in research on teacher preparation. Building a better knowledge base about teacher preparation in general can help ensure that those who are leading programs will have at least part of the information they need to design effective learning experiences for teacher candidates. Faculty who conduct research on teacher preparation, along with program leaders who stay abreast of the latest scientific articles and reports about the topic, can use what they learn to inform programmatic decision-making and thereby improve programmatic outcomes.

Another approach to helping programs improve is to increase accountability — holding programs accountable for candidate experiences and outcomes — through increased transparency, for example. For this approach, a state (or even a teacher preparation program sponsor) might require programs to make outcome data publicly available and easily accessible, which could mean that programs with poor outcomes would attract fewer candidates (and less funding) and thereby be incentivized to improve.

While both research and accountability can play roles in helping teacher preparation programs to improve, both approaches also have limitations. Research often presents a mixed and incomplete picture, missing the knowledge necessary for replication of quality outcomes across diverse contexts (e.g., National Research Council, 2012). Accountability focuses on incentives, but if the people leading and managing programs do not know how to improve, then this knowledge gap — rather than any issue with incentives — may be the real problem (e.g., Tyack & Cuban, 1997).

This paper focuses on a third approach to improving teacher preparation programs: *organizational learning*, and specifically on the type of organizational learning known as improvement science. The theory underpinning this approach is that substantial, sustained improvement is most likely to result from sustained inquiry into the way a program produces its current outcomes, inquiry that includes “testing” specific changes that could lead to better outcomes. An organizational learning approach focuses on identifying when, where, and how to make changes to achieve a specific outcome.

Improvement science is a family of approaches that can guide and structure organizational learning by connecting disciplined inquiry to a focused improvement goal. The intellectual foundations of improvement science come from Walter A. Shewhart (1939) and W. Edwards Deming (1986, 2000) who developed and applied improvement

approaches to a range of industries, most notably automobile manufacturing (e.g., Womack, Jones, & Roos, 1990).

Improvement science methodologies are increasingly being applied to other sectors to address a wide range of problems. Donald Berwick founded the Institute for Healthcare Improvement (IHI) in 1991 with the goal of achieving better outcomes in health systems. Most recently, organizational scholars like Peter Senge (1990) and Anthony S. Bryk and colleagues (2015) have worked to adapt improvement science for use in educational systems.

Building on this work, WestEd/SRI continuous improvement technical assistance has focused on adapting improvement science methodologies to help NGEI partnerships learn to improve. Three principles provide a foundation for this organizational learning approach to improvement: (1) all improvement begins with dissatisfaction with the status quo; (2) every system is perfectly designed to get the results it gets; and (3) all improvement requires change, but not every change is an improvement.

1. All improvement begins with dissatisfaction with the status quo.

One principle of effective organizational learning is that motivation to change must outweigh the inertia of the status quo. Focused, disciplined organizational learning is hard. It takes time, which is a scarce and precious commodity in education organizations. It requires employees to question organizational processes, structures, and norms and — on the basis of what they learn from that questioning — to change how work happens. And it depends on having leadership that prioritizes and supports improvement efforts, removes organizational barriers to change, and creates a culture of learning and improvement.

Given the hard work involved in organizational learning, successful efforts are typically driven by clear dissatisfaction with the way things are rather than by a vague desire to get incrementally better. Occasionally, such motivation already exists as a result of changes in external conditions — as when, for example, new competition or public pressure increases survival anxiety within the organization. But when there is no existing motivation, leaders can cultivate it. Kurt Lewin (1947) described this process as “unfreezing,” whereby leaders create an organizational context that moves people to feel the need for change. More recently, Edgar Schein (2017) has summarized a range of strategies that organizational leaders can use to prompt dissatisfaction with the status quo while also mitigating the fears often associated with change.

In an effort to improve a program, an *aim statement* can be a helpful tool for defining the focus of the effort by clarifying the specific performance gap that the improvement effort seeks to close. Similar to SMART goals, aim statements are specific, measurable, achievable, relevant, and time-bound. As such, they require an understanding of the baseline level of performance. In addition, an aim statement focuses on a specific, meaningful outcome rather than on the nuts and bolts of implementation. This focus creates space to learn and adapt program changes based on what works for whom, and under what conditions.

At the outset of the WestEd/SRI process of providing technical assistance to NGEI, all NGEI project teams (those leading NGEI efforts in each campus/district partnership, typically consisting of faculty members) worked toward articulating an improvement aim. Most NGEI sites (7 of the 11 total sites) identified feedback to teacher candidates as the focus for their aims, specifically aiming to improve the reliability of providing feedback or to improve the quality or nature of feedback. Other sites focused on improving master teacher recruitment, selection, and development (2 sites); aligning coursework around prioritized skills (1 site); or improving the quality of clinical placement sites (1 site).

Focusing improvement efforts — CSU Stanislaus

The CSU Stanislaus NGEI project team has been working to improve the quality of candidate placement. Early versions of its aim statement focused on the percentage of candidates placed at anchor school sites. Anchor sites are schools designated as preferred placement sites, where five or more teacher candidates might all be placed. The theory was that placing more candidates in anchor sites would facilitate more community among candidates and closer relationships between the university supervisor and school staff, improving candidates' learning experiences.

However, Stanislaus realized that data about anchor school placement did not provide information about the outcome they cared most about: the quality of candidate placement. So the NGEI team revised its aim statement to focus on how satisfied candidates and supervisors are with each cooperating teacher. Each semester, teacher candidates and supervisors complete an end-of-term survey that provides the teacher preparation program with feedback on the cooperating teacher. This survey includes an item with a five-point scale that asks for an overall assessment and whether the respondent would recommend the cooperating teacher for future placements of teacher candidates.

Analyzing five semesters of survey data provided a baseline understanding of how satisfied candidates and supervisors were with cooperating teachers — data that had not been regularly analyzed or discussed up until this point. Having the data raised an important question: What was the teacher preparation program's

operational definition of a quality placement? Specifically, what survey score(s) would indicate an acceptable placement experience? After reviewing the data, the team decided that for a placement to be considered a success, both the supervisor and the teacher candidate should rate the cooperating teacher a “4” or a “5” on the scale, as scores of “3” or lower typically indicated more serious concerns.

With baseline data and an operational definition of success, the Stanislaus team was able to formulate the following aim statement: “By June 30, 2019, CSU Stanislaus will increase the number of cooperating teachers recommended by both candidates and supervisors from 60% to 90%.”

The low percentage of recommended cooperating teachers highlighted three important patterns that the team will work to understand. The first is that the matched survey response rate was relatively low, at 65 percent, meaning that the program had incomplete or no survey data on approximately a third of the cooperating teachers. The team hypothesized that candidates and supervisors who experienced or saw problematic instruction or mentoring were most likely to respond to the survey request. If so, increasing survey response rates should substantially increase the percentage of recommended cooperating teachers.

A second notable pattern was that candidates and supervisors frequently diverged in their assessments of cooperating teachers. For example, of the 12 cooperating teachers who received a score below a 4, only 2 of those teachers received low scores from both cooperating teachers and supervisors. To achieve its improvement aim, the Stanislaus team needs to better understand the different reasons candidates and supervisors do not recommend cooperating teachers.

A third pattern — still to be investigated — is the extent to which particular program structures, such as anchor schools, result in fewer problematic placements.

As the Stanislaus example illustrates, a well-defined aim statement — especially one anchored in baseline data closely connected to a desired outcome — can go a long way toward framing and motivating a focused improvement effort.

2. Every system is perfectly designed to get the results it gets.

A second principle of effective organizational learning is that it requires a systems perspective, an understanding that outcomes result from the complex interactions between system elements. Paul Batalden summed up a central insight about systems when he noted that “every system is perfectly designed to get the results it gets” (Conway & Batalden, 2015, para. 5) — an observation that shifts focus from the knowledge, skills, and effort of *individuals* to the design of *organizations*. When a system does not reliably produce a desired outcome, it is because the processes, structures, and norms of the organization have not been designed to achieve that outcome.

For many people, thinking in terms of systems does not come naturally. The tendency is to place responsibility for negative outcomes entirely on individuals — thinking, for example, that the work did not happen as it was supposed to because the person

responsible did not care enough, or work hard enough, or have the necessary ability. An organizational learning approach, in contrast, is all about the system, endeavoring to help those working within it to understand the interdependence of their work.

One way to identify interdependencies is to ask *why* — why did work not happen as intended? Maybe the person didn't care about something because they didn't see how their work affected others. Maybe they did care but they didn't have the time to do the work properly. Or maybe they didn't have the ability to do the work because they had never been adequately trained.

Teacher preparation requires high levels of coordination between teacher preparation institutions and the districts with which they partner to deliver clinical experiences to pre-service teachers. Ensuring that these clinical experiences are well-aligned with coursework requires significant ongoing coordination across institutions at multiple levels. Initiating organizational learning entails helping all those working within the program — course instructors, supervisors, mentor teachers, and others — to understand how their work depends on and feeds back into their colleagues' work.

Mapping is one powerful way that improvement efforts visually represent and analyze systems. Maps can be created at the micro level, illustrating the steps in a particular process carried out by the system, for example. Or they can represent the macro level, illustrating the linkages among different processes or the system overall. Maps can be used to diagnose potential issues and can be used to model an ideal process against which current performance can be assessed. (See DrawToast.com for an elaboration on the role of mapping in improvement efforts.)

Understanding feedback as a process — Cal Poly, San Luis Obispo

The NGEI team at Cal Poly, San Luis Obispo has been using mapping techniques to improve feedback to teacher candidates. One of the team's main ways of doing so has been by creating protocols that articulate (i.e., map) ideal feedback processes and examining data to understand the relationship between the ideal and the actual processes.

To help teacher candidates develop as educators, Cal Poly's programs provide coursework, a yearlong clinical experience, and mentoring by teacher educators who include university faculty, partner district cooperating teachers, and university supervisors. Upon beginning the continuous improvement effort supported through the NGEI grant, the Cal Poly team understood that quality feedback is important for teacher candidate growth and preparedness (Holland & Thayer, 1989; Lyle, 1996; Stones, 1987); however, after attempting to assess current practice, the team

realized that it could not accurately characterize the quality of the written feedback that Cal Poly's teacher candidates received from university supervisors.

To remedy this situation, the Cal Poly team began by analyzing a baseline, representative sample of observation reports submitted by university supervisors. Data showed a great deal of variability in the written feedback that they provided, including variation in the amount, content, and emphasis of the feedback. Therefore, the team began to examine the feedback system in order to better understand why this outcome varied so much.

First, the Cal Poly team made efforts to understand the process by which university supervisors were giving and submitting feedback. These efforts included conducting interviews with university supervisors and having them analyze the feedback they gave, reflecting on what could have influenced the nature of the feedback they provided. Additionally, inconsistency with submissions — including omitted, duplicated, and mislabeled observation reports — led the team to create a protocol that would serve as a map for what to include in submitting feedback. The team also provided training around the protocol. In order to sustain clean submission of reports, the School of Education Assessment Coordinator provided quarterly feedback for each university supervisor on report submissions.

Second, the team focused its analysis on the *content* and *quality* of written feedback provided by university supervisors, looking at how the actual feedback mapped onto the ideal (outlined by the protocol). The team's baseline coding of written feedback indicated variation in scoring and qualitative feedback, demonstrating a lack of a shared understanding or norming around the prioritized skills, which led to engaging university supervisors in defining quality written feedback and in video norming sessions. Cal Poly's NGEI team sought to better understand the variation through conducting "learning sprints" that involved coding written feedback units for dimensions of quality feedback. The team defined quality written feedback as (a) evidence-based, (b) representative of a breadth of prioritized skills, (c) including a variety of learning-focused supervision stances, and (d) balanced in suggestions for praise and growth. A lack of feedback given in certain content areas, in combination with interviews with university supervisors, revealed a need for training on particular prioritized skills, mainly on the skills needed for supporting emergent bilinguals.

Lastly, the Cal Poly team conducted a series of workshops to provide more support to the university supervisors and increase the quality of their written feedback. The team was interested in studying the effectiveness of this support and did so in a variety of ways. At the conclusion of each workshop, the team distributed surveys assessing effectiveness and usefulness of the professional development that had been provided. Focus group and individual interviews with university supervisors allowed the Cal Poly team to better understand the supervisors' needs as professionals, resulting in the Cal Poly team providing enhanced supports and changing the feedback process. The team was also very interested in understanding whether its professional development efforts focusing on supporting emergent bilinguals made a difference in the written feedback that university supervisors provided, so the team surveyed teacher candidates to determine their perceptions on the feedback that they had received from university supervisors. In addition, the Cal Poly team conducted two "learning sprints," the first focusing on the quality of feedback on supporting emergent bilinguals prior to any professional

development, and the second sprint identifying if there had been a change in feedback provided after supervisors received yearlong professional development on supporting emergent bilinguals.

Through these mapping efforts, the Cal Poly team was able to analyze the variation of supervisor feedback across its teacher preparation programs. The team's continuous improvement efforts allowed it to better understand its supervision system, the feedback process, the quality of feedback provided to teacher candidates, and the types and effectiveness of support that could be provided to supervisors in order to improve that feedback.

3. All improvement requires change, but not every change is an improvement.

A third principle of effective organizational learning has to do with the behavior of complex systems. In a simple system, the relationship between cause and effect can sometimes be directly observed. In a complex system, knowing what changes will improve the system is exceedingly difficult, as is knowing what changes will have little effect or might produce unintended consequences.

Don Berwick's observation (1996) that not all change is an improvement suggests the connection between organizational learning and improvement. To ensure that changes to a system actually make the system better, organizations need a disciplined inquiry process for building knowledge over time. An effective learning process typically involves three components: a working theory about how to improve a system, the collection and analysis of data against which the working theory can be assessed, and a mechanism for testing and learning from changes.

The working theory explains what a group of people currently believe about their system and/or their improvement effort. Working theories can explain beliefs about the operation of the current system and *why* it is producing its current results. These theories can also articulate a target or ideal state — that is, how the system would operate if it was working as intended. Finally, working theories can articulate a theory of change — that is, how the current system needs to be modified to achieve the desired state and, thus, desired outcomes. Over time, organizational learning informs and gets consolidated in the articulation and ongoing refinement of working theories. (A helpful resource on this topic is “What’s Your Theory?” by Bennett & Provost, 2015.)

Data serve as an anchor for developing working theories and as feedback to use in refining theories over time. Both quantitative and qualitative data contribute to this process and can provide a window into the current or baseline performance of a system. Data can also measure progress toward desired outcomes. And, when connected to a

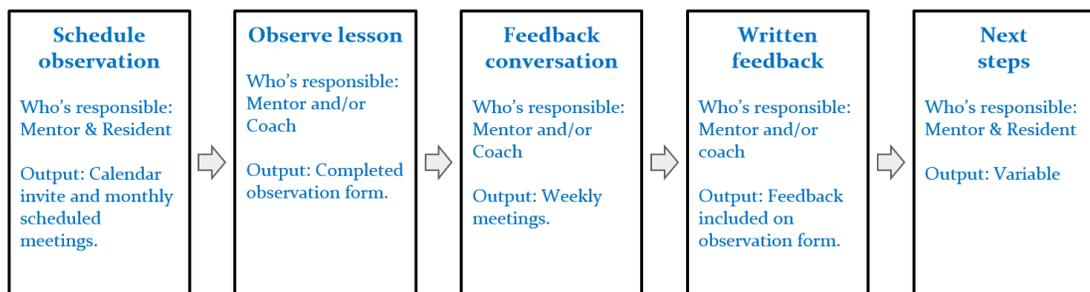
system of measures, data support a process for articulating, testing, and revising working theories. They provide the empirical foundation for organizational learning.

Finally, **a disciplined testing process embeds inquiry into the system and into efforts to transform that system.** One commonly used tool for supporting disciplined testing is the Plan, Do, Study, Act (PDSA) cycle (Langley et al., 2009), though many more versions of inquiry cycles, including some that are less formal, can also be used. Disciplined testing in an organizational learning and improvement context differs from traditional research in that its primary goal is to produce local knowledge for improving operations and management. Consequently, the PDSA cycle is designed to be quick and efficient, building knowledge through iteration and replication across varied conditions rather than through bigger, slower, and higher-stakes testing or research. CSU Bakersfield’s effort to improve reliability of feedback processes illustrates the role of testing change.

Tests of change — CSU Bakersfield

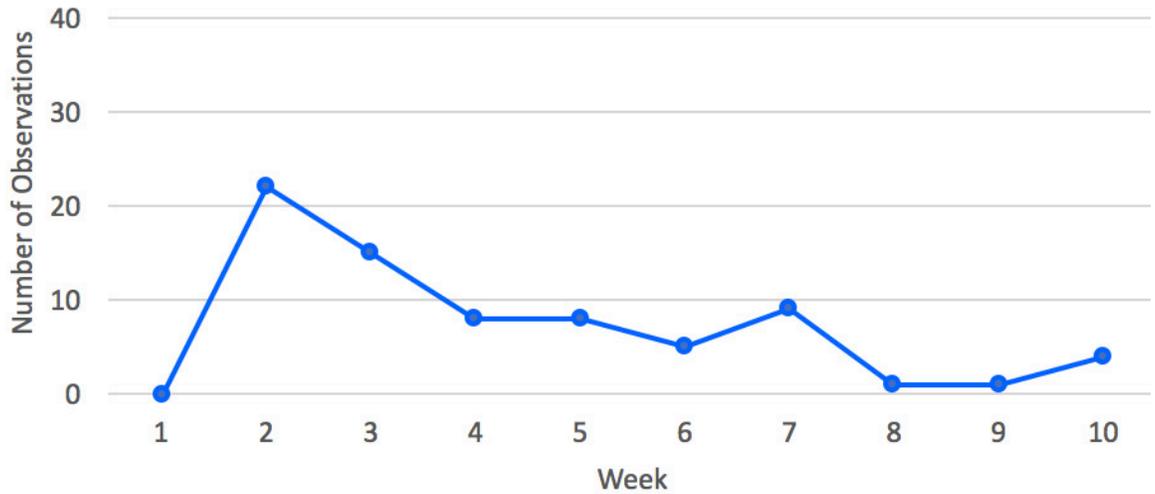
At the Kern Urban Teacher Residency Program, a partnership between CSU Bakersfield and the Bakersfield City School District, the NGEI team homed in on improving the process by which residents (teacher candidates who are placed in residencies in schools) are observed by mentor teachers and receive feedback on their practice. Program leaders believe that the mentor-resident connection is one of the main components of the success in the teacher preparation program. The steps of the program’s observation-and-feedback process are delineated in the following process map (Figure 1).

Figure 1. Bakersfield Observation and Feedback Process



Early steps in the work of trying to improve this process included understanding the current performance of the system through data. Two key learnings that grew out of this analysis were that (1) the existing system of data collection about mentor teacher observations was not as reliable as it could be and (2) the picture that was emerging from the data was of an inconsistent observation process. As evident in the number of observations conducted over the course of spring 2017 (Figure 2), most observations occurred early in the semester and then trailed off.

Figure 2. Number of Observations Per Week, January 23 – March 17, 2017

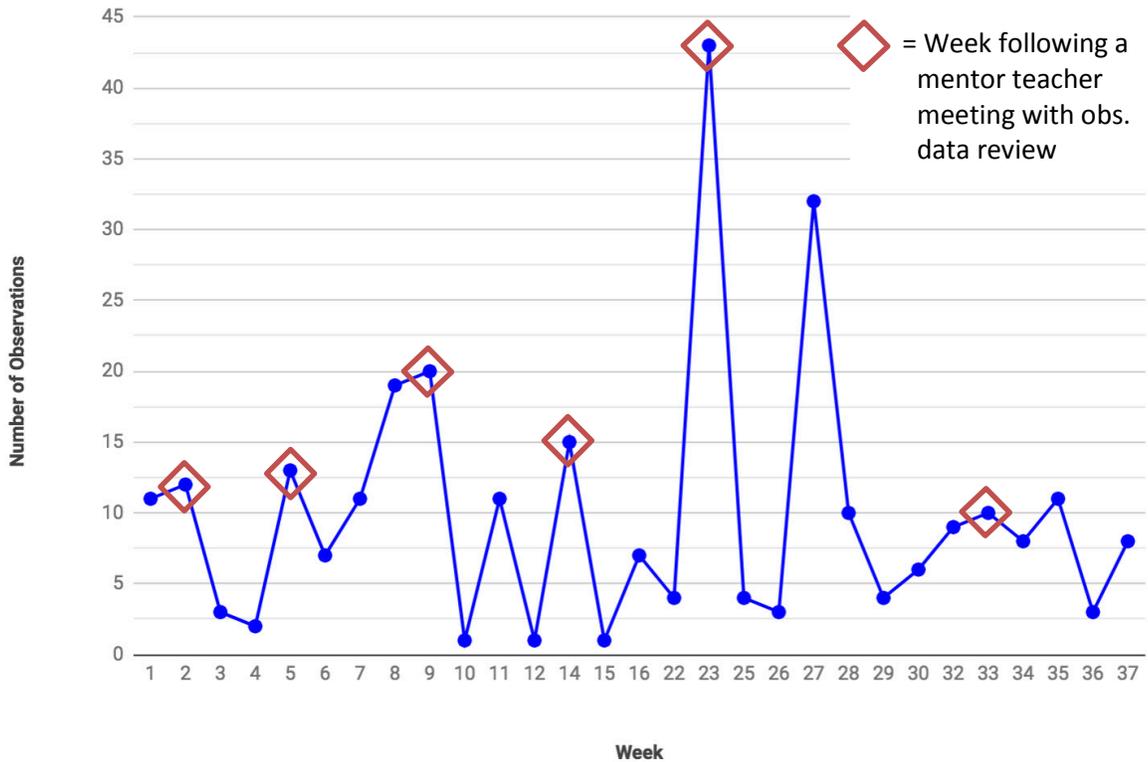


These learnings led to changes in the observation-and-feedback process that became embedded in the system through series of “tests of change.” The first set of changes were made to the observation tool that mentor teachers were using to record their observations and written feedback (Step 2 of the observation-and-feedback process). Changing the format of the tool to an online platform enabled immediate access to reliable data about the frequency of the observations. By testing the new tool with users, the team improved it to serve multiple needs, including enabling each mentor teacher to quickly and easily communicate the observation feedback with the resident.

The second set of changes focused on improving the regularity of mentor observations (Steps 1 and 2 of the process). Having real-time data about observation frequency allowed the Bakersfield City Schools lead to regularly review these data with mentors during their monthly meetings. These reviews were coupled with conversations about the importance of frequent feedback and its role in the development of residents.

The data from the 2017/18 school year show observations occurring on a regular basis, rather than trailing off after the initial burst of activity (Figure 3). Even when there were weeks in which few observations occurred, these weeks were almost always followed by a surge of observation activity in the subsequent week. The meetings with mentor teachers were also often followed by a spike in observation activity.

Figure 3. Number of Observations by Week, Fall 2017 – Spring 2018



CSU Bakersfield intends to maintain the current system, while adding an additional improvement focus on the quality of written feedback (Step 4 of the process map). The team continues to keep its eyes on the ultimate aim of strong mentor-resident connections and a greater sense of support that residents feel from their program and mentor.

Building the Learning Capacity of Teacher Preparation Programs

The three principles described in the previous section have shaped the content and structure of WestEd’s and SRI’s technical assistance for NGEI. The central challenge of assisting NGEI was developing a support process that was sensitive to variation among teacher preparation programs, standard enough to encourage cross-program learning and to provide support at scale, and lean enough to fit within the NGEI budget.

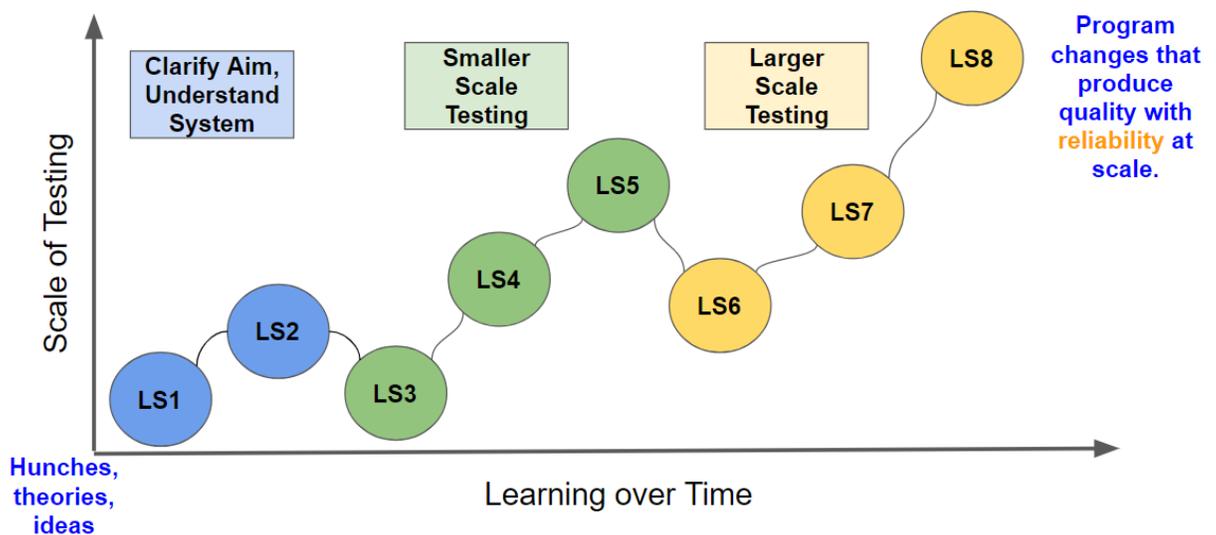
To encourage an iterative, short-cycle learning process, WestEd/SRI guided each site through a series of “learning sprints,” each lasting 90 days. The sprint structure originally came from Proctor & Gamble, whose innovation model encouraged rapid scanning and connecting with existing knowledge rather than building from scratch (Huston & Sakkab,

2006). This model was subsequently adapted by IHI and the Carnegie Foundation for the Advancement of Teaching to support rapid problem analysis, prototyping, and testing (Park & Takahashi, 2013).

Across NGEI sites, each partnership’s learning sprint was led by a Continuous Improvement Lead who facilitated a small, internal improvement team. The process was designed to accelerate learning and program improvement toward a specific *improvement aim*. Each sprint begins by defining a sprint *learning goal* — what the team needs to learn, develop, or test by the conclusion of the sprint. Over the three-year duration of each NGEI grant, each NGEI campus/district partnership will have the opportunity to engage in at least eight sequential sprints. The aspiration is for the cumulative learning across these sprints to develop the knowledge necessary for each partnership to achieve its improvement aim.

Figure 4 illustrates a hypothetical progression of learning sprints over time. The learning in early sprints typically focuses on understanding the system that is producing the problem and developing a well-defined improvement aim for the overarching effort. As the problem and associated aim become clearer, learning sprints focus on the identification, development, and testing of changes. Finally, as confidence in one or more changes builds, smaller-scale testing shifts to larger-scale testing and full-scale implementation.

Figure 4. Learning Sprints Build Toward *Effective Implementation*



The learning sprint process — CSU Monterey Bay

CSU Monterey Bay began its improvement work under NGEI with an improvement aim focused on increasing the number of STEM-ready elementary teachers entering the field to address a large, local teaching shortage. In its first learning sprint, the Monterey Bay partnership examined the current state of the teacher education program and the program's role in the local teacher preparation pipeline. Through this process, the partnership realized that different clinical coaches were providing very different support to candidates.

Building on this learning, the second learning sprint focused on engaging various stakeholders (i.e., pre-service teacher candidates, clinical coaches, and cooperating teachers) needed to make systemic change for improving the STEM teaching practices among the partnership's pre-service population. The sprint identified problems with the current support structures that were being provided to these stakeholders, and the sprint participants prototyped and tested a new coaching rubric.

In year 2, the third learning sprint expanded the supports provided to clinical coaches by testing a revised and elaborated rubric (and associated protocols) to improve feedback to teacher candidates. And learning sprints 4 and 5 expanded the audience for professional supports to include cooperating teachers. Whereas the clinical coaches reported to the university, the program had more limited authority over the professional learning of cooperating teachers. Consequently, expanding participation and supports to cooperating teachers raised new challenges and learning opportunities.

Conclusion

The S. D. Bechtel, Jr. Foundation funded NGEI with the goal of better preparing teachers to implement the CCSS and the NGSS. To accomplish this goal, NGEI has focused on driving improvements in five areas: partnerships, prioritized skills, feedback to teacher candidates, clinical placements, and continuous improvement processes.

This Innovation Highlight has described how continuous improvement through improvement science, an organizational learning approach, can cut across the four other kinds of improvements. Improving teacher preparation is not simply a problem of growing research knowledge or increasing accountability for program outcomes. It requires a focused commitment to improvement, an understanding of the system producing the current results, and a process for learning whether program changes are improvements. Improvement science offers a methodology for learning to improve in this way.

Ultimately, organizational learning and improvement are the responsibility of leadership. Through NGEI, WestEd and SRI have worked to provide continuous improvement technical assistance to interested partnerships with the goal of building the capacity of programs. To continue this work, program and system leaders will need to sustain their commitment to learning how to improve the clinical preparation of their teacher candidates.

References

- Bennett, B., & Provost, L. (2015, July). What's your theory? Driver diagram serves as tool for building and testing theories for improvement. *Quality Progress (QP)*, 36–43. Retrieved from http://www.apweb.org/QP_what's-your-theory_201507.pdf
- Berwick, D. (1996). A primer on leading the improvement of systems. *The British Medical Journal*, 312, 619–622.
- Bryk, A. S., Gomez, L., Grunow, A., & LeMahieu, P. (2015). *Learning to improve: How America's schools can get better at getting better*. Cambridge, MA: Harvard Education Publishing.
- Coburn, C. E., Penuel, W. R., & Geil, K. E. (2013). *Research-practice partnerships: A strategy for leveraging research for educational improvement in school districts*. New York, NY: William T. Grant Foundation.
- Conway, E., & Batalden, P. (2015). *Like magic? ("Every system is perfectly designed...")*. Boston, MA: Institute for Healthcare Improvement. Retrieved from <http://www.ihl.org/communities/blogs/origin-of-every-system-is-perfectly-designed-quote>
- Deming, W. E. (2000). *The new economics for industry, government, education*. Cambridge, MA: MIT Press.
- Deming, W. E. (1986). *Out of the crisis*. Cambridge, MA: MIT Press.
- Goldhaber, D., Liddle, S., & Theobald, R. (2013). The gateway to the profession: Assessing teacher preparation programs based on student achievement. *Economics of Education Review*, 34, 29–44.
- Hannan, M., Russell, J., Takahashi, S., & Park, S. (2015). Using improvement science to better support beginning teachers: The case of the Building a Teaching Effectiveness Network. *Journal of Teacher Education*, 66(5), 494–508.
- Holland, P. W., & Thayer, D. T. (1989). *The kernel method of equating score distributions*. ETS Research Report Series, Technical Report No. 89-84. Princeton, NJ: Educational Testing Service.
- Huston, L., & Sakkab, N. (2006). Connect and develop: Inside Procter & Gamble's new model for innovation. *Harvard Business Review*, 84(3), 58–67.
- Langley, G., Moen, R., Nolan, K., Nolan, T., Norman, C., & Provost, L. (2009). *The improvement guide: A practical approach to enhancing organizational performance, second edition*. San Francisco, CA: Jossey-Bass.

- Lewin, K. (1947). Frontiers in group dynamics: Concept, method and reality in social science: Social equilibria and social change. *Human Relations*, 1, 5-41.
- Lewis, S. (2015). Qualitative inquiry and research design: Choosing among five approaches. *Health Promotion Practice*, 16(4), 473-475.
- Lyle, J. T. (1996). *Regenerative design for sustainable development*. Hoboken, NJ: John Wiley & Sons.
- National Academy of Sciences, National Academy of Engineering, & Institute of Medicine. (2007). *Rising above the gathering storm: Energizing and employing America for a brighter future*. Washington, DC: The National Academies Press.
- National Research Council. (2012). *Using science as evidence in public policy*. Washington, DC: The National Academies Press.
- Park, S., & Takahashi, S. (2013). *90-day cycle handbook*. Stanford, CA: Carnegie Foundation for the Advancement of Teaching.
- Schein, E. H. (2017). *Organizational culture and leadership*. San Francisco, CA: Jossey-Bass.
- Senge, P. M. (1990). *The fifth discipline: The art and practice of the learning organization*. New York, NY: Doubleday/Currency.
- Shewhart, W. A. (1939). *Statistical method from the viewpoint of quality control*. Washington, DC: The Graduate School, Department of Agriculture.
- Stones, E. (1987). Teaching practice supervision: Bridge between theory and practice. *European Journal of Teacher Education*, 10(1), 67-79.
- Tyack, D., & Cuban, L. (1997). *Tinkering toward utopia: A century of public school reform*. Cambridge, MA: Harvard University Press.
- Womack, J. P., Jones, D. T., & Roos, D. (1990). *The machine that changed the world*. New York, NY: Free Press.