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Applying improvement science tools, methods, and principles to curriculum refinement in California State University teacher preparation programs

Improving Teacher Preparation: An Organizational Approach

Jonathan R. Dolle, Melissa Eiler White, Sola Takahashi, and Corey Donahue

Abstract

This article describes a network-based effort–the New Generation of Educators Initiative (NGEI)–that applies the principles and methods of improvement science to the challenge of improving how new teachers are prepared in the California State University System. The initiative promoted clinically based teacher preparation, situated in strong district-university partnerships, and emphasized 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 inform clinical support and teaching during the school year, and identify meaningful programmatic changes. This article describes the overall improvement philosophy of this work and the most intensive of these supports: a professional learning support structure called the Improvement Research Fellowship.

Keywords

Improvement Science, Teacher Preparation, Improvement Research, Continuous Improvement, Quality Improvement, Networked Improvement, Systems.

Introduction

Improving the quality of teacher preparation in a pressing problem in the United States (Goldhaber, Liddle, & Theobald, 2013; National Academy of Sciences, National Academy of Engineering, & Institute of Medicine, 2007). Throughout 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 earlier effort to improve feedback for beginning teachers in three large urban districts demonstrates the promise of improvement science methods for tackling persistent challenges in teaching (Hannan, Russell, Takahashi, & Park, 2015).

1. There are four pervasive issues that need to be addressed to enable teacher preparation programs to consistently prepare graduates to enter the workforce able to teach students to challenging standards: There is substantial variation in graduates' teaching effectiveness both within and across preparation programs (Goldhaber, Liddle, & Theobald, 2013).
2. There is a lack of consensus about the subset of expert teaching skills that candidates must learn in order to enter the profession, which is a barrier to ensuring candidates have opportunities to learn and practice high-priority skills (Ball & Foranzi, 2009).
3. Clinical practice provides critical opportunities for candidates to learn to teach effectively. Teacher preparation offers fewer opportunities for clinical practice than preparation programs in other practice professions (Grossman, Hammerness, & McDonald, 2009).
4. Programs offer candidates inconsistent learning opportunities, especially (though not exclusively) in their clinical experiences. For example, cooperating teachers vary

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substantially in their own teaching skills as well as their skills mentoring candidates (Grossman, 2010).

This article 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 (e.g., 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 promoted clinically based teacher preparation, situated in strong district-university partnerships, and emphasized 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 inform clinical support and teaching during the school year, and identify meaningful programmatic changes.

From January 2015 through June 2019, NGEI provided grants to CSU campuses and their district partners to improve their teacher preparation programs (hereafter, TPPs). These resources supported programmatic reforms in five areas: partnership with districts, prioritized skills, practice-based clinical preparation, formative feedback on prioritized skills, and data-driven continuous improvement.

NGEI-funded TPPs also received technical assistance from WestEd, which developed a multipronged technical assistance strategy informed by improvement science. The support included improvement coaching and networked learning experiences with teams at the individual teacher preparation programs funded via NGEI. This article describes the overall improvement philosophy of this work and the most intensive of these supports: a professional learning support structure we called the Improvement Research Fellowship (hereafter, IRF).

Improvement science is an approach to managing organizations that prioritizes the ability to develop, adapt, and implement reliable processes to produce a specific outcome. Because organizations are complex, it can be hard to predict what work processes will lead to the desired outcome. Consequently, organizations need to establish practices that enable them to learn to improve. In practice, this often involves investigations into current organizational processes, structures, and norms; the disciplined testing of changes; and the scaling and management of standard work processes.

Improvement science guides and structures 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). However, improvement science methodologies are now being applied to an even wider range of problems. In 1991, Donald Berwick founded the Institute for Healthcare Improvement (IHI) with the goal of achieving better outcomes in health systems. And more 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.

NGEI presented a unique opportunity to use improvement science to improve teacher preparation within the California State University system. (See the introduction in this special issue.) As the continuous improvement technical assistance provider, WestEd introduced improvement science as a conceptual and methodological foundation for building the organizational learning capacity of a network of TPP organizational learning approaches to getting better and as a methodological foundation for targeted improvement efforts within teacher preparation programs. The second section describes the conceptual foundation for this approach. The third section details the specific design and methodology of the IRF, and the final section summarizes the key conclusions from this work.

Conceptual Foundation

Three principles serve as a conceptual foundation for an organizational learning approach to improvement: all improvement begins with dissatisfaction with the status quo; every system is perfectly designed to get the results it gets; and all improvement requires change, but not every change is an improvement.

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. 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.

Disciplined improvement work is hard. It takes time, which is a scarce and precious commodity in education organizations. It requires employees to question the way work happens and—on the basis of what they learn from this questioning—to make changes. It depends on having leadership that prioritizes and supports improvement efforts, removes organizational barriers to change, and creates a culture of learning and improvement.

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—a that is, 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)—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, or 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, work hard enough, have the necessary ability. An organizational learning approach, in contrast, focuses on 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 affects 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 or because no organization-wide standard for how the work should be done was established. Even when undesirable outcomes can be traced to individual action, the systemic forces behind those actions become the object of change.

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 is straightforward and 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 helps explain 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.

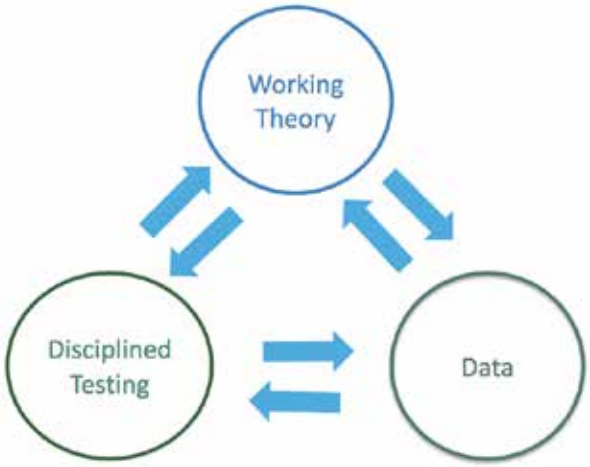

Figure 1: A Learning System

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. Working theories can describe a theory of change—that is, how the current system needs to be modified to achieve the desired state and, thus, desired outcomes. In 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.

Structure and Content of the Improvement Research Fellowship

While these principles provide a rationale for an organizational learning approach to improvement, most TPPs need practical guidance and support to engage in focused improvement efforts. This section describes two support structures for strengthening the learning capacity of CSU TPPs.

Learning Sprints

In October 2016, a year and a half before the start of the IRF, the initial improvement technical assistance work with the NGEI campuses was organized as a series of seven or eight "learning sprints." Ten TPPs participated in the learning sprint process, and each was led by a continuous improvement lead—a new role established as part of the NGEI reforms for each program. Each sprint focused on a single learning goal for 90 days. Early learning goals focused on problem identification and investigation, system mapping, and improvement theory building around a focused aim. Later sprints typically focused on prototype development and testing, data collection and analysis, and knowledge consolidation. During each sprint, leads were offered monthly coaching calls and each sprint culminated with a cross-program share-out celebrating the learning from the previous three months. Through multiple sprints, the goal was to build local program knowledge to tackle a focused improvement problem and, in so doing, introduce new habits and mindsets within the campus teams.

From our perspective, the learning sprint process was successful in several respects. The delivery model was largely virtual, with webinars at the beginning of each sprint typically introducing a new improvement tool or concept and coaching over the course of the sprint supporting its effective application while guiding improvement efforts overall. Based on survey results and anecdotal feedback, WestEd found that a number of programs were enthusiastic about the work and eager for more support. And the cross-program sharing at the end of each sprint encouraged sustained focus and helped programs see different, relevant examples of improvement tools and concepts in use.

However, success was also limited by many continuous improvement leads working independently, without a larger improvement team. This was particularly challenging when leads identified problems in work processes for which others were responsible. Some district partners and organizational leaders were not closely connected with improvement efforts and therefore unable to champion efforts within their respective systems. The webinars inherently provided limited support context for introducing and practicing the use of improvement science tools and methods. In addition, participation was limited by uncertain connection of the work to research methodology, the publication demands of tenure, and promotion requirements of universities.

Improvement Research Fellowship

In an effort to build on the successes and address the limitations of the learning sprint support structure, WestEd requested and received funding for a year-long improvement research fellowship from the S. D. Bechtel, Jr. Foundation for 2018-19. The goal of the fellowship was to deepen the organizational learning and improvement capacity of the CSU teacher preparation system by providing intensive, targeted support to a limited number of programs with a demonstrated interest in this work.

WestEd asked CSU programs to submit an application explaining their context, naming their problem of practice, and identifying a team composed of three to four members of the teacher preparation program and representatives from at least one district partner. Teams also needed to identify two organizational leaders with significant roles in their respective systems that ultimately would be affected by the work of the fellowship team. This way these leaders understood the context of the work that is being done and can help champion it in their organizations. The four teams selected included the campuses of California Polytechnic State University, San Luis Obispo; CSU, Bakersfield; and CSU, Fresno as well as the Educator Quality (EdQ) Center out of the CSU Chancellor's Office.

Although the problem focus for the teams varied, each applied improvement science methods to a high-leverage problem of practice in their respective teacher preparation programs. Through their work in the Fellowship, these fellows defined the problem they sought to address, developed an overall goal for their work together, generated a theory of practice improvement, determined measures they will use to determine whether changes they introduced would lead to improvements, and used

a systematic disciplined method to test these change ideas. Each of these steps was facilitated through WestEd using improvement science principles and tools. As a foundation for this work, WestEd drew heavily on two improvement science resources. *The Improvement Guide: A Practical Approach to Enhancing Organizational Performance* (Langley, et al., 2009) introduced the "Model for Improvement" and provided detailed methodological guidance. And *Learning to Improve: How America's Schools Can Get Better at Getting Better* (Bryk, et al., 2015) which provided examples of improvement methods applied to educational problems.

Throughout the course of the year-long fellowship, from August 2018 to July 2019, each team participated in five, usually two-day, in-person learning sessions introducing improvement science concepts tailored to a teacher preparation context. Between trainings, fellowship teams received ongoing coaching from WestEd staff and improvement reviews, where teams would present their work to improvement science experts for feedback. In addition, fellows used this as an opportunity to advance their research regarding how to successfully manage an improvement science project in a teacher preparation program. With the expectation that fellows would publish their work—the culmination of which appears in this volume, the Improvement Research Fellowship met a dual goal of further building a research base for improvement work in the teacher preparation space.

Content of the Fellowship

The fellowship experience was structured in a way that facilitated the fellows building their improvement capacity in each of the three principles listed in the section above. The table below represents how the content of each learning session helped to address where fellowship teams would be developing their skills in certain areas.

The sessions were designed to operationalize each of the three foundational principles outlined in the previous section. With regard to the first principle—"All improvement begins with dissatisfaction of the status quo"—fellows submitted proposals for improvement projects that expanded upon and/or deepened the impact of their NGEI efforts. These proposals were focused on a specific problem of practice that fellows were experiencing and one they wanted eagerly to improve upon. In addition, in learning session two, fellows set clear and specific aims that would keep them focused on the important outcome they had in mind.

With regard to the second principle—"Every system is perfectly designed to get the results it gets"—fellows spent the first two learning sessions investigating their systems to better understand what is producing problems. By conducting empathy interviews with key stakeholders, especially teacher candidates, fellows were able to better learn from those who are experiencing problems firsthand. By examining data on the performance of their system, fellows could better see where and for what groups

Table 1: Learning Session Content

LEARNING SESSION ONE The Improvement Journey and Seeing the System	LEARNING SESSION TWO Theory and Testing	LEARNING SESSION THREE Building Evidence	LEARNING SESSION FOUR (ONE DAY) Sustaining Improvements	LEARNING SESSION FIVE Documenting Learning and Impact
– Establish group norms for engaging in improvement work – Provide all participants an experience with an "improvement journey" – Introduce four key improvement ideas: • Learning through investigation and testing • Learning through collaboration • Learning through system analysis • Learning through disciplined practice	– Build our improvement science expertise, setting aside our content expertise hat. – Understand and experience several learning cycles	– Use improvement methodologies to make measurable progress toward their improvement aims. – Understand and be able to articulate the key shifts implied by an improvement science approach – PDSA ramps, common processes, run charts, change packages	– Share and celebrate the progress of the improvement teams – Reflect on how fellows and key leaders can support the institutionalization of improvement efforts – Take stock of three outcomes of improvement work	– Calibration across teams about their articles – Leave with a complete draft of their article – Leave with a specific plan for any next steps/revisions – Teams/fellows will feel a sense of accomplishment: challenge that was met

they might focus their efforts. And lastly, by mapping the processes that exist in their systems, fellows could diagnose potential problem areas and identify what might be a more ideal system.

For the last principle—"All improvement requires change, but not every change is an improvement"—fellows engaged in a variety of activities to learn what kind of changes might lead to improvement. These specifically centered around the principle's three primary components seen in Figure 1: development of 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. In the development of a theory of improvement during the second learning session, fellows took what they learned from their systems investigation and used it to develop a working theory (in this case, a driver diagram) that represents their aim and the set of activities that they believe would help them accomplish this aim (for more on driver diagrams, see Bennett & Provost, 2015 and Bryk, Gomez, Grunow, & LeMahieu, 2015).

In order to use data to assess the theory of improvement, fellows spent the second learning session identifying not only an outcome measure that was represented in their aim, but also process measures that could be tracked more frequently and with tighter alignment to particular components of their system (for more on measurement for improvement, see Solberg, Mosser, & McDonald, 1997; Bennett, 2018; Takahashi, White, & Donahue, 2019). The mechanism that fellows used to test and learn from changes was the PDSA cycle (for more on PDSAs, see: Langley et al., 2009). Fellows were coached in the third and fourth learning sessions on the development and prototyping of their first change idea as well as each of the steps in its testing during the second learning session.

Operationalizing this learning loop seen in Figure 1 requires changes in team routines and meeting structures. Through the learning sessions, the fellows learned about how various structures and routines might help create sustainable and lasting improvement. These include meeting structures for various purposes as well as the institution of standard work routines that can help ensure the work continues beyond the length of the fellowship. (for more on improvement routines and standard work, see Grunow, Hough, Park, Willis & Krausen, 2018 and Barnas, 2014).

Standards for Quality Improvement Reporting Excellence (SQUIRE)

At key intervals throughout their improvement journey, fellows consolidated their learning and documented their efforts in writing, ultimately producing the manuscripts collected in the ensuing pages of this journal issue. The writing was produced using the framework provided by the SQUIRE guidelines (Orginc, Davies, Goodman, Batalden, Stevens, and Davidoff, 2015). SQUIRE, which stands for Standards for Quality Improvement Reporting Excellence, was first published in 2005 in the healthcare field, as a way to standardize and to raise the quality of the reporting of quality improvement work. The framework outlines key elements of a written product for an improvement effort, such as pertinent facets of the context of change efforts, or the evolution of a particular intervention or practice as an improvement team's learning deepens. In practical use, the SQUIRE guidelines not only offered a structure for documenting learning, but also provided a way to identify what learning was yet to transpire, but desired.

Conclusion

The S. D. Bechtel, Jr. Foundation funded NGEI with the goal of better preparing teachers to implement the Common Core State Standards and the Next Generation Science Standards. 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.

To meet the large and growing demands being placed on teacher preparation programs, we believe an organizational learning approach to improving candidate outcomes will be an essential strategy for meeting these demands. 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 cannot be sustained without the vision and ongoing engagement of organizational leadership. WestEd and SRI have provided continuous improvement technical assistance to interested partnerships through NGEI 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.

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Jonathan R. Dolle

Jonathan R. Dolle, Ph.D., *is an area director at WestEd, where he leads the improvement science content team. His current work focuses on supporting district, state, and higher education responses to the COVID-19 crisis. Dolle is also co-founder and chair of the American Educational Research Association's Improvement Science in Education special interest group. Prior to joining WestEd, Dolle spent ten years at the Carnegie Foundation for the Advancement of Teaching, where he led the Foundation's network development and evaluation efforts. He can be reached at jdolle@wested.org.*

Melissa Eiler White

Melissa Eiler White, Ph.D., *is project director at WestEd, where she leads research, evaluation, and technical assistance projects focused on teachers and teaching. Throughout the last several years, her work has focused on supporting improvement of teacher preparation programs through formative evaluation and improvement science-based technical assistance. White has also led numerous research efforts for the Regional Educational Laboratory West (REL West) at WestEd. She may be reached at mwhite@wested.org.*

Sola Takahashi

Sola Takahashi, Ed.D., *is a Senior Research Associate at WestEd, where she leads the work of integrating continuous improvement methods in the coaching, technical assistance, and research conducted by the Innovation Studies department. Takahashi specializes in the design and use of measurement and analytics that inform continuous improvement efforts, from the identification of measures to the issues of collection, analysis and visualization, and social sensemaking routines. Her areas of content interest include the teaching profession and educational equity. She served as a public school teacher for several years. Contact her via email at stakaha@wested.org.*

Corey Donahue

Corey Donahue, B.A., *is an improvement specialist at WestEd, where he provides support to schools, districts, and higher education institutions to help them better learn how to improve. Prior to joining WestEd, Donahue worked as a coordinator of school performance at the Oakland Unified School District, which he entered as an education pioneers analyst fellow. Prior to that, he was the special associate to the president for the Carnegie Foundation for the Advancement of Teaching, an education non-profit in the Bay Area of San Francisco. He can be reached at cdonahu@wested.org.*

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