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An introduction
to the theoretical
underpinnings
of improvement
science

Improvement Science: An Approach to Making Teacher Preparation More Reliably Effective at Scale

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Pre-service teacher preparation plays an essential role in developing the quality teaching that can be offered to students. However, teacher preparation is characterized by considerable variability in how teachers are prepared that, in turn, produces variability in graduates' teaching practice and effectiveness, both within and across preparation programs (Boyd, Grossman, Lankford, Loeb, & Wyckoff 2009; Goldhaber, Liddle, & Theobald, 2013).

For decades, policy makers, researchers, and practitioners have engaged in a range of large-scale efforts to improve the quality of teacher preparation, many of them motivated by accountability and compliance, such as holding programs accountable for candidate experiences and outcomes. Programs have been required to make outcome data publicly available and then receive rewards or sanctions to incentivize improvements. A second major approach to improving teacher preparation has been investment in research intended to inform and guide practice. This approach is supported by a theory that closing knowledge gaps about what approaches are most effective will lead to better results.

While both research and accountability can play roles in helping teacher preparation programs to improve, both approaches also have serious limitations. Research often presents a mixed or incomplete picture, very often missing essential knowledge necessary for producing quality outcomes reliably and at scale across diverse contexts (e.g., National Research Council, 2012). Accountability focuses on incentives to stimulate motivation, on the assumption that those leading teacher preparation programs both know how and have the wherewithal to improve. But it is often these gaps—rather than the nature of the incentives or a lack of motivation—that is the real problem (e.g., Tyack & Cuban, 1997).

This volume introduces and elaborates a third mechanism for improving teacher preparation. It is one that is focused on closing specific identified gaps in performance, informed by an understanding of the system producing the current results, guided by a publicly shared theory of improvement, and warranted through a process for learning whether program changes are improvements. This approach, called improvement science, offers promise for supporting largescale improvements in teacher preparation because it explicitly addresses the impacts of context on practice, and it provides a disciplined means of testing proposed practices to warrant them as improvements, reducing variability in outcomes. Improvement science offers a complement to traditional research approaches that more typically reveal *what* can work. It is one that provides improvement knowledge intended to inform *how* to make things work.

In recent years, improvement science has found utility in a number of initiatives aimed at the professional preparation, growth, development, and leadership of teachers. Many of these efforts have taken the form of Networked Improvement Communities (NICs) (Bryk, Gomez, Grunow & LeMahieu, 2015; LeMahieu, Grunow, Nordstrom, & Baker, 2017), deploying the methods of improvement science in cross-institution networks focused on complex challenges of quality in specific parts of the teaching career continuum. One of these was launched in 2018 by the Raise Your Hand Texas Foundation, bringing together teacher preparation programs from across the state of Texas (Wetzel, et al., 2019). These 11 programs across 10 universities are working collaboratively to improve the preparation of



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teachers across all subjects and grade levels. The first of these networks is focused on the very beginning of the career continuum: strengthening the teacher-candidate pipeline and candidates' perseverance through their course of preparation.

The second network is focused on strengthening the quality of clinical experiences so that all teacher candidates experience a coherent system of high-quality coaching supports.

Reflective of the initiatives described in this volume, early efforts in these Texas networks have focused on the development of a shared understanding of their problems and the systems that give rise to them. Common language and data collection mechanisms, shared theories of improvement, and related testing of changes have begun to generate scalable improvement knowledge for which the NICs provide a uniquely effective social organization for spreading these improvements.

Improvement science has also emerged in the teacher preparation space focused on specific subject areas or teacher populations. The Mathematics Teacher Education Partnership is a set of NICs involving more than 90 universities that was formed in 2012 to address the undersupply of secondary mathematics teachers who are well prepared to help their students attain the goals of the Common Core State Standards and other college- and career-ready standards (Martin & Gobsetin, 2015; LeMahieu & Smith, 2020). In 2014, the American Association of Colleges of Teacher Education (AACTE) invited institutions to participate in a NIC to develop and test strategies to increase the number of African-American and Hispanic/ Latino men receiving initial teaching certification (American Association of Colleges for Teacher Education, 2019). AACTE continues to support this network into testing changes that will lead to improved recruitment, while they are also incorporating improvement science methods into an emerging effort focused on addressing the shortage and lack of diversity of fully prepared and credentialed special education teachers in public schools across the nation.

These networks provide evidence of the interest in and effectiveness of teacher educators working collectively to use improvement science to solve persistent challenges in the teacher preparation sector. The efforts described in this volume add important voices and new insights to this growing base of knowledge. Collectively, they illustrate certain themes that recur as efforts emerge to apply improvement science to persistent problems of practice in education. Here, at the outset, the reader is encouraged to look for and note the ways in which these issues emerge, are defined, and influence the efforts to apply improvement science in these several cases.

Specifically, these themes include the following:

- moving from individual to coordinated collective action;

- the promise and challenge of empirical, data-informed transformation of practice;
- the shift in mindsets necessary to engage in improvement science;
- how significant change at scale can arise from iterative testing of modest changes in practice; and
- the challenges of implementing collaborative partnerships—especially as they may be encountered in the context of higher education settings.

Each of these themes is elaborated in the accounts that follow in this volume, and the reader is urged to be alert regarding them. Collectively, these illustrations of improvement science in practice offer important insights into how it is done—from initiation through execution, from issues encountered to their impact and significance to how they may be addressed. Taken together, they offer much to those who seek a rigorous methodology to instill improvement that is deep, widespread, and enduring.

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