HOOVER EDUCATION

Understanding the Promise and Reality of Continuous Improvement in US Public Schools

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The language and processes associated with focused organizational improvement—long in use among private businesses and corporations—have become increasingly common in public and nonprofit sectors. For example, the concept of "continuous improvement" (CI) featured prominently in the most recent state plans for implementing K–12 school accountability under the Every Student Succeeds Act (ESSA), though the federal law does not actually require it (Klein 2018). Within this ESSA context, CI is understood quite broadly as an iterative process "in which student performance data are constantly collected and analyzed and used to target resources and interventions" (McGuinn 2019). One commentator characterized the state plans as simply saying, "We have data, we're looking at data, we're using it to set up plans, we're not just picking something out of a hat and hoping" (Klein 2018). However, the concept of CI has both deep historical antecedents in US public schools and a diverse variety of forms in current education policy and practice.

In this essay, I discuss what is meant by CI in education and what is known about driving organizational improvement through CI initiatives, both in education and elsewhere. I underscore two broad conclusions. First, though CI has considerable conceptual appeal as a strategy for improving public education, the credible empirical evidence in support of its impact, particularly in education, is at best limited. Second, as with any promising innovation, realizing the promise of CI, particularly at scale, faces deep and pervasive implementation challenges. I also offer constructive thoughts on the changes needed for public education to better realize the considerable promise of CI initiatives.

BACKGROUND

The origins of CI trace back to nineteenth and early twentieth centuries and studies of focused strategies for promoting industrial efficiency (Bhuiyan and Baghel 2005). Notably,

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such "Taylorist" notions of "scientific management" (Taylor 1911) were almost immediately and profoundly influential in reshaping the governance and operations of US public schools into the system we have today. In particular, technocratic notions of efficiency motivated the dramatic consolidation of schools and school districts, the introduction of graded school structures, the standardization of curricula, the character of classroom management, and more formal systems of teacher training and compensation (e.g., Tyack 1974).

After World War II, the US government and management experts such as Deming (1993) promoted the training of private sector supervisors in CI principles, both domestically and abroad. Modern variants of this general CI approach to improving both systems and processes include "lean manufacturing," "six sigma," "balanced scorecard," and "lean six sigma" (Bhuiyan and Baghel 2005). Broader management frameworks and standards (e.g., Baldrige Excellence Framework, Total Quality Management, ISO 9000) also embed CI principles. The targeted promotion of CI (or *kaizen*) had a particularly notable influence on the development of postwar Japanese manufacturing. Notably, within Japan distinct forms of *kaizen* exist at the management or corporate level, at the group level (e.g., employee teams solving grounded problems without managerial interference), and at the level of individual workers (Imai 1986).

A similar taxonomy provides a useful framework for understanding the diverse ways in which CI principles are discussed and used in US public education. For example, individual teachers who iteratively adopt, assess, and refine changes in their classroom pedagogy are effectively engaging in CI (e.g., Betts et al. 2024). The same can be said of teachers who support the academic progress of individual students through data-driven instruction and multi-tiered systems of supports (MTSS). At the state and national levels, the systems of school accountability that have gone to scale and evolved over the last three decades are also explicitly understood as continuous improvement in that they involve monitoring the performance of individual schools and targeting some for focused improvement (Klein 2018).

However, in education, the focus of CI (or "improvement science") is most often at the group level. Specifically, whether it's in a state department of education, a school district, or a school, CI begins with the careful selection of "improvement team" members who convene to solve a specific problem of practice (Shakman et al. 2020). Improvement teams sometimes organize around a shared problem of practice and include members across a district, state, or region as a "networked improvement community" (Bryk et al. 2011).

Regardless, the core and defining function of any CI team centers on the management and execution of iterative "PDSA" cycles. These cycles consist of four distinct and sequenced actions:

1. **Plan:** Articulating a specific and measurable problem to be addressed, assessing the problem's root causes, and identifying relevant interventions or practices that are evidence based
2. **Do:** Implementing a promising new practice or policy and collecting data

3. **Study:** Collectively examining the data to understand the reform implementation and impact
4. **Act:** Scaling effective reforms, refining promising but incomplete reforms, and replacing ineffective reforms ("adopt, adapt, or abandon")

CI's focus on PDSA cycles embeds a concept of change that emphasizes collective effort, organizational learning, and the context-specific, user-centered nature of both the problem being confronted and its solutions (Bryk et al. 2015). CI also tacitly reflects the "betting on the tortoise" view (Foster et al. 2024) that large-scale change takes time and occurs enduringly through focused, incremental improvements that build organizational capacity and momentum.

The basic principles of CI are widely seen as a fundamental part of effective management practices and business excellence. CI's face validity as well as prominent examples of manufacturing success ground its broad appeal. However, credibly evaluating CI as a conceptual approach (e.g., through a randomized trial) is generally seen as impractical given its highly context-specific character as an intervention (e.g., individual teams choosing both their specific focus and their aligned performance metrics). The available descriptive evidence on the performance of private-sector CI initiatives underscores the challenges of realizing CI's vision consistently.

For example, several different reviews (e.g., McLean et al. 2015; Singh and Singh 2015) discuss the evidence that CI-themed change initiatives in the private sector are actually more likely to fail than succeed; success rates vary from 10 to 40 percent. McLean et al. (2015) state that "it is clear that a substantial amount of money and resources are being squandered globally every year in the unsuccessful pursuit of organisational change." They note that organizational culture and the motives and expectations of relevant employees figure prominently in most of these failures. Similarly, Axelrod et al. (2006) note that 70 percent of change initiatives fail to reach their intended objective and attribute this to the prevalence of top-down approaches that limit the broad, democratic engagement of relevant individuals.

Similarly, over the last several decades CI has become increasingly prominent in healthcare, where it is described as "transforming medicine" (Kenney 2008) largely, though not exclusively, on the basis of compelling case studies. However, as with private-sector CI initiatives, research studies underscore the challenge of realizing CI's vision consistently. In a structured review, Taylor et al. (2014) identified forty-seven peer-reviewed studies that described using PDSA for improving the quality of healthcare and that had sufficient detail for assessment. They found that less than 20 percent of these studies reported actually using iterative cycles while only 14 percent used data frequently (i.e., at least monthly). They concluded that "these results demonstrate poor compliance with key principles of the PDSA method, suggesting that it is not being used optimally."

CONTINUOUS IMPROVEMENT IN EDUCATION

The explicit embrace of CI in education is more recent than in healthcare but similarly reflects both a high degree of enthusiasm for CI as a concept and a counterbalancing concern about our capacity to implement CI consistently and effectively. For example, Bryk (2011) advocates for a science of improvement in education that will integrate the causal validity of randomized trials with the grounded, contextual nature of action research ("multiple, small rapid tests of change by varied individuals working under different conditions"). He argues that "when this activity is organized around causal thinking that links hypothesized solutions to rigorous problem analysis and common data, we accelerate learning for improvement at scale." Relatedly, in a recent review article, Yurkofsky et al. (2020) also note that, although CI seems "anodyne" and uncontroversial, it is "actually quite radical." Specifically, it erodes top-down policymaking, promotes the active production and use of evidence among educators, and can encourage educators to cultivate a critical awareness of the barriers to learning in their schools.

However, Yurkofsky et al. (2020) also predict that, instead of this vision for large-scale change, the most likely outcome for CI efforts in education is a type of inert "assimilation," that is, changes in education practice that are more cosmetic than substantive. Specifically, they note that "teachers adopt inquiry cycles but inquire in ways that are consistent with their pedagogical priors, and researchers and schools work together in ways that allow them to win grants and produce publications but do not lead to deep improvements in practice."

Similarly, as in domains outside of education, commentators in education have noticed the difficulty of implementing CI well and consistently (e.g., Elgart 2017). Yurkofsky et al. (2020) distinguish between implementation barriers that are above or below "the green line." Intervention-level traits of organizations (e.g., structures, operations, staffing) can create conventional implementation barriers that are "above the green line." Specifically, such potential barriers to CI implementation include resources to support staff time, data and research literacy among improvement-team members, the existence of high-functioning and supportive data systems in schools, and the sustained institutional and political will necessary to realize CI's vision of larger-scale impact over time through smaller-scale improvements.

In contrast, less-visible organizational traits that are relational in nature (e.g., trust, relationships, identity) can also accelerate or impede CI's impact. This perspective closely parallels the evidence on failed change initiatives in business and healthcare, which stressed the frequent absence of individual-level agency and engagement.

On a more optimistic note, Cohen-Vogel et al. (2015) recognize the novel and helpful ways in which academic researchers can support the high-fidelity implementation of CI in schools, for example, by supporting improvement teams through data and research. Indeed, researchers do often participate in CI-themed initiatives, particularly through design-based improvement efforts, researcher-practitioner partnerships, and networked improvement communities. However, in discussing improvement science and the use of evidence under

ESSA, Dynarski (2015) notes that there simply is not enough research capacity in the nation to meet the at-scale needs of our school system (e.g., over three million K–12 teachers serving fifty million students).

EVIDENCE ON CI'S IMPACT IN EDUCATION

The limited and mixed empirical evidence from studies of the impact of CI in education substantiates this blend of enthusiasm and cynicism. For example, the most prominent and large-scale effort to promote CI in education is, arguably, the in-progress Networks for School Improvement (NSI) initiative funded by the Bill and Melinda Gates Foundation. The core goal of this effort is to increase the proportion of Black, Hispanic, and low-income students who are on track for high school graduation and college enrollment. The NSI seeks to do so by supporting networks of schools using CI methods to improve relevant teacher practices and supports for students. The Foundation is spending over $300 million to implement and study the NSI in three cohorts of schools (nearly eight hundred schools from roughly 150 large and mostly urban school districts and charter networks).

An "intermediary organization" (e.g., a school district, CMO [charter management organization], or nonprofit) leads each network, which typically consists of about twenty schools. Each network also focuses on one or more outcome domains: (1) on-track indicators for high school graduation and college enrollment among eighth and ninth graders, (2) college readiness among eleventh and twelfth graders, and (3) "well-matched" college enrollment among twelfth graders. Each network also has one of three "entry points" that characterize their core CI activities: (1) instructional improvement, (2) early warning and support, and (3) supporting postsecondary access and persistence.

Recently released interim (year 2) results indicate that the early impact of this CI-themed initiative on student outcomes is mixed (Johnson et al. 2024). Specifically, results based on matched comparisons and a randomized trial found that NSI did not significantly change any of the grade eight on-track components (e.g., GPA, math/ELA [English language arts] courses passed, test scores, attendance, and suspensions). However, the NSI did significantly improve three of the five grade nine on-track measures: a 0.13 increase in GPA and a 4-percentage-point increase in both the share of core courses passed and the share of students earning at least five credits. The authors suggest that these results may partly reflect the COVID-19 context. The grade eight NSI focused on instructional improvement at a time when many teachers were adapting to remote instruction. In contrast, the grade nine NSI stressed academic support, tutoring, and developing relationships with students, which may have been particularly salient in the pandemic context. The interim results also indicate that the networks focused on postsecondary enrollment have not seen a statistically significant increase in college enrollment. However, completion rates for the Free Application for Federal Student Aid (FAFSA) increased by 4 percentage points.

However, apart from the early result from the NSI evaluation, the empirical evidence on the impact of CI in education is limited. For example, Feygin et al. (2020) conducted a systematic

review of studies, both unpublished and published, that mentioned key aspects of CI such as "PDSA," "improvement science," "inquiry cycles," or "networked improvement." They identified over three hundred articles. However, after the sequenced screening of abstracts and full text using broad inclusion criteria, only seven articles remained. Specifically, two of the key inclusion criteria were that the article actually had a primary focus on an aspect of CI (e.g., PDSA cycles, improvement science) and that it met a broad definition of empirical research ("the collection and analysis of either qualitative or quantitative data"). Of these articles, three assessed only an implementation, not an impact on outcomes. Collectively, these studies indicate that a high-quality implementation includes a careful documentation of PDSA cycles and a dedicated staff member who can manage the consistent application of PDSA cycles and reduce the burden on teachers and principals.

The four outcome studies identified in this systematic review provide highly qualified evidence on the impact of CI methods. For example, one study (Ell and Meissel 2011) focused on a "PDSA-like" process to improve math instruction in five rural New Zealand schools. This study found that student performance on an aligned math assessment improved during this process. However, the study lacked a comparison group that might provide a counterfactual for these time-varying changes.

The remaining three studies focused on college-level, developmental math courses (Statway and Quantway) developed by the Carnegie Foundation for the Advancement of Teaching (Yamada and Bryk 2016; Huang and Yamada 2017; Yamada et al. 2018). The faculty teaching these courses participated in a networked improvement community that focused on the continuous improvement of teaching and learning. Inferences based on propensity-score matching found that students who participated in these courses had higher engagement in future college-level math courses relative to students in conventional developmental courses. However, these inferences do not separate the impact of the teachers' CI activities from effects associated with a distinctive course (Feygin et al. 2020).

To seek further evidence on CI's impact in education, I also investigated the research findings of awards made by the Institute of Education Sciences (IES) for "Continuous Improvement Research in Education" nearly ten years ago. Under this program, IES made six awards totaling roughly $15 million for a diverse set of projects that featured CI (i.e., roughly $2.5 million per project). I searched for and found the subsequent research reports from five of these six grantees. One of these projects did not clearly feature a CI-themed approach, while two others focused on studying program implementation rather than outcomes.

The two remaining studies that examined CI's effects on student outcomes found mixed results. Mac Iver et al. (2021) found that there was no impact, relative to comparison school districts, of a CI-themed effort to promote family engagement and school attendance during the transition from middle school to high school. However, a "difference in differences" study by Betts et al. (2024) found test-score gains (ES = 0.11) in four middle schools where math teachers joined professional learning communities using CI to identify student needs and to field responsive lesson plans.

CONCLUSION

As a strategy for organizational improvement, CI has an undeniable appeal that explains its broad and enduring prominence across multiple domains of human activity. In principle, CI compellingly blends a locally grounded, problem-focused emphasis on measurable change with an insistence on the iterative and frequent use of data and rigorous evidence. However, in education and other domains, the evidence on the actual impact of CI-themed initiatives is, ironically, limited and sobering. The inconsistent evidence of CI's impact partly reflects the simple fact that its highly local and flexible approach to identifying and solving problems renders it inherently difficult to evaluate relative to standardized interventions. Nonetheless, the high failure rates of CI initiatives and the broad evidence of the barriers to its implementation illustrate the considerable challenges of realizing its promise.

This pattern—a conceptually compelling reform that is not consistently effective because it often results in incomplete or cosmetic compliance—is undoubtedly a familiar one to close observers of public policies and interventions. What would it take to break this pattern and realize CI's potential for educational improvement more consistently? I would underscore four distinct factors:

1. High-quality data systems for rapid assessments of implementation and impact
2. Staff training for implementing CI
3. Staff time for managing CI processes effectively
4. Institutional commitment to a CI timeline for organizational improvement

CI requires frequent and rapid access to highly local and relevant data as part of PDSA cycles. In many school districts, data systems that are built largely for operations and compliance may not readily support this core function. Over the last two decades, a prominent federal grant program for Statewide Longitudinal Data Systems (SLDS) has sought to build systems that "manage, analyze, disaggregate, and use" student-level data (National Center for Education Statistics 2024). Cumulatively, this initiative has awarded $721 million to all but three states. These foundational investments are a necessary support for CI efforts because they facilitate tracking of students whose mobility across schools and districts can otherwise threaten reliable evaluations. Because SLDS investments often focus on "early childhood through workforce" data, they also make it more feasible to examine important longer-run outcomes. However, the extent to which these grants are creating systems that are readily accessible and used by local educators is unclear (Conaway et al. 2015).

Second, schools' capacity to implement CI effectively likely requires focused, new training among a broad cross section of in-service staff—for example, as part of already-extant professional development. Furthermore, realizing CI's promise at scale could also involve a reformulation of the preservice training for teachers and principals who will be asked to implement these initiatives. This training should be more than a generic overview of CI. For CI planning and PDSA cycles to work well, this training needs to support staff capacity to understand and

use data, to read and build evidence critically, and to manage change initiatives. Fortunately, some relevant training resources (e.g., Shakman et al. 2020; Walston and Conley 2022; Cuiccio and Husby-Slater 2018) already exist. However, successful improvement teams will also need to understand and address the "relational" challenges of authentically engaging the key colleagues who would actually implement change within classrooms and schools (Yurkofsky et al. 2020).

Third, the evidence from CI's implementation failures indicates the need for targeted resources to support a change initiative. Most notably, the available evidence indicates that release time for a trained improvement-team leader who can lessen the practical burdens of PDSA cycles for principals and teachers is particularly important. Focused efforts to fund this time and to study its impact may be a particularly promising way to understand and to establish what CI can achieve in education.

Fourth, realizing CI's potential in education requires that districts and schools muster an enduring institutional will. CI's vision of organizational improvement is one that takes time. It seeks to build large-scale change through the accumulation and momentum of meaningful but small-scale improvements. However, reform initiatives with school districts are often as short lived as the tenures of the school superintendents who promote them. The literature on organizational turnarounds (Herman et al. 2008) suggests that prioritizing quick, early wins can attenuate this problem. Extending executive education on CI to school board members and to the longer-tenured senior district staff may also establish a firm "betting on the tortoise" commitment that allows CI's promise to be realized.

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