

Redesigning the District Operating System

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MAY 2015



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PUBLIC EDUCATION

About This Report

ACKNOWLEDGMENTS

This report was made possible by a grant from Carnegie Corporation of New York. We thank the Corporation for its support. However, the statements made and views expressed are solely the responsibility of the author. The author thanks Paul Hill and Robin Lake of CRPE for making this paper smarter, and Shawn Rubin of the Highlander Institute and Lori McEwen of Providence Public Schools whose early feedback made it more useful.

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ABOUT THE CENTER ON REINVENTING PUBLIC EDUCATION

Through research and policy analysis, CRPE seeks ways to make public education more effective, especially for America's disadvantaged students. We help redesign governance, oversight, and dynamic education delivery systems to make it possible for great educators to do their best work with students and to create a wide range of high-quality public school options for families.

Our work emphasizes evidence over posture and confronts hard truths. We search outside the traditional boundaries of public education to find pragmatic, equitable, and promising approaches to address the complex challenges facing public education. Our goal is to create new possibilities for the parents, educators, and public officials who strive to improve America's schools.

CRPE is a nonpartisan, self-sustaining organization affiliated with the University of Washington Bothell. Our work is funded through private philanthropic dollars, federal grants, and contracts.

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Introduction

Since the passage of NCLB in 2002 and the awarding of \$4.3 billion in Race to the Top grants between 2009-2011, Local Education Agencies (LEAs) and, to a lesser extent, State Education Agencies (SEAs) have embarked on dozens of new initiatives aimed at improving student outcomes. The associated adoption of Common Core standards and accompanying assessments by more than 40 states has gone further to redefine those outcomes. These shifts and others require significant new development and deployment of professional development and other components of human capital, of curricula and training materials, and of IT hardware, software, and connectivity associated with instruction, management, and assessment of learning.

During this time, the landscape of public education has changed dramatically. It now routinely includes features that were cutting-edge, beyond the pale, or unimagined a decade ago. These include systems for formative assessment and personalized instruction, alternative pathways for teachers, administrators, and superintendents, the explosive growth of inexpensive cloud-

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based SaaS, numerous new models for school restructuring, the arrival in force of charter schools and networks, and the growing understanding of how LEAs can best manage portfolios of schools. The Bloomberg-Klein administration in NYC was arguably the epicenter of many of these changes,

creating exemplars and providing leaders for numerous districts around the country including Washington, D.C., New Orleans, Newark, and Denver. The path of families through the system in these districts is now substantially different from what it was 12 years ago, with a wider array of choices at many points and with different notions of responsiveness and accountability.

Yet in many ways, districts—including the exemplars above—retain their old look and feel to a remarkable degree. Relative to the tremendous amount of money, political capital, legislative action, and public debate that has been invested in change, much of the day-to-day experience of families, educators, and school and central administrators often feels essentially unchanged. Communication still flows outward and downward. Instructional models take a back seat to bus schedules. Vendor pools are stagnant and bidding and contracting processes look much as they did decades ago. The internal sharing of operations and academic data still takes place largely over email and externally through PDFs and press releases. Even as districts pursue new policies, they tend to go about it in the same old ways: despite having a new destination, the modes of action and the assumptions that govern implementation remain remarkably the same.¹

The best analogy may be to a software stack: you can change your word processor or spreadsheet program as often as you like but your Mac will still feel like a Mac and a Windows computer like Windows. Despite one program having different features than another, it is the underlying OS X or Windows operating system (“OS”) that largely determines your experience. The OS both enables and limits what applications can do, how they look and sound, how you interact with them, and how they interact with one another. Without an OS, applications couldn’t even open or close. In education, high-level policies like school choice or teacher accountability are the equivalent of the word processor while day-to-day practice is equivalent to the operating system—less visible but also broader and deeper than any one policy “application,” and the mechanism through which the abstraction of policy gets translated into real-world activity.

1. This “timelessness” is common to government services. However, in no other instance have so many resources been expended with the explicit goal of changing a government service’s attributes and its outputs. Understanding the change-resistant character in education may shorten the redesign curve of other government services.

In public education, this District Operating System (“DOS”) is a set of interlocking, mutually reinforcing modules that includes (but isn’t limited to) functions like procurement, contracting, data and IT policy, the general counsel’s office, human resources, and the systems for employee and family engagement. DOS components encompass most of the day-to-day functions of districts apart from instruction (though they deeply affect instruction).² They generally share the following attributes:

- Though not formally part of the accountability loop, their attitudes and behaviors determine the supports available to practitioners and others who are.
- Their domains are considered arcane and/or laden with political or regulatory risk.
- They are staffed by career employees who both predate and outlast senior district leadership.
- Their work cultures are guided more by “how things are done here” than by best-practice standards or key performance indicators.
- They are seldom the objects of district reform efforts. Because they are assumed to be fixed, reform either works through or around them.

The fact that they typically stand outside of “policy” does not make DOS functions marginal. On the contrary, since the DOS is the web of systemic procedural practice through which high-level goals are implemented, it is central to districts’ ability to properly address the problems that policy defines.

In one way or another, nearly all functions above the classroom level exist to support the work done in the classroom. DOS functions are therefore tools—means to an end—but they also determine what other tools and frameworks can be conceived and brought to bear and which are ruled out a priori. As an arbiter and facilitator, this set of functions has served us poorly, even in the more limited, standardized context of traditional legacy school structures. Worse, these functions are fundamentally ill-suited to the requirements of new modes of personalized instruction, demanding academic standards, autonomous schools, empowered educators, and parent choice in the school enrollment process.

Policy cannot translate to practice except through tools, and the DOS defines the limits of our tool kit. As Marshall McLuhan said, we shape our tools and then our tools shape us.

THE POLICY-PRACTICE CONTINUUM

Throughout this paper I will, for the sake of brevity, speak of “policy” and “practice” as distinct from one another, which they are at their definitional extremes in general, though there is an overlapping middle ground of enormous importance.³ For example, for decades it has been noted in New York that the specialized high schools, admission to which is based on exam scores, enroll many fewer black and Hispanic students than do non-exam schools. If an administration decided to change this it would act in the following cascade, each aspect of which is a form of policy descending from de jure to de facto:

2. Deciding to embrace Common Core State Standards is not a DOS function, for example, but the processes for evaluating, contracting for, or developing a curriculum to support these standards are, as are the mechanisms for creating and delivering (or purchasing) professional development for them.

3. Policy is commonly believed to drive practice. In fact, the influence is as great or greater in the other direction: it is practice that translates, amplifies, or frustrates policy. While a policy without a practice regime is the proverbial tree falling in the forest, traditional and *ad hoc* practice can—indeed often does—fill gaps left by policy voids or out-muscle fledgling policy as it attempts to take hold.

1. Set high-level policy goals. “Our STEM magnet schools should be diverse.” This stage is nearly pure “policy,” the “What we will do.”
2. Create procedural policy. “We will do this by decreasing the impact of inequitable exam scores on admissions decisions.” This is the stage where DOS functionaries (here, perhaps the legal department) typically decide whether or not to enable the policy goal. They do this by pronouncing under what conditions (if any) they deem it “legally” viable. This stage is a soup of policy/practice, the “Whether we may do it.”
3. Institute procedural practice. “We will alter the exam in the following ways to change the scoring curve.” This is “administration” (the colloquial term for DOS daily practice), the detail where the devil lives. This stage is nearly pure practice, the “How we will do it.”

An analog of this cascade is the procession from:



Any policy goal must transit this progression in order to be implemented. Another example might be:

1. “We will increase the individualization of instruction.” (High-level policy).
2. “This is how we should/must procure hardware and software and implement training.” (Procedural policy).
3. “This is the roll-out plan for the devices.” (Procedural practice).

Thus, the path from policy to practice is much like a sequence of translations across several languages and then back again. At each step the local idiom introduces assumptions and shifts in meaning that when successively compounded lead to an output that is a caricature of the original goal. That this is taken for granted is demonstrated by the occasional exceptions to the rule, those cases in which the policy is so important (read, politicized) that it is highly risky for it to be “mistranslated” as it works its way through the DOS. In such cases the superintendent, school board, and press will keep a close eye on each phase to ensure that it does not deviate too far from what is sensible in implementing those policy goals, at least for as long the scrutiny lasts.

Obviously, the vast majority of the thousands of routine actions and decisions in the “procedural practice” category are necessarily unscrutinized (otherwise nothing could get done). It is these that I mean by “practice” and here that the persistent DOS effects are most consequential.

PRACTICE CULTURES

Far from being monolithic, school districts are amalgams of several different subcultures of practice that abut as much as or more than they overlap.⁴ In large urban districts, DOS practice is heavily determined by the blue-collar trade cultures from which school employees—like other municipal service departments such as fire, sanitation, police and general services—are historically drawn.

4. These include teachers, school administrators, athletic staff, central office workers, curriculum and instruction teams, and those responsible for logistics functions like transportation and food service.

The work cultures of unionized trades and municipal services are grounded in similar assumptions: craft apprenticeship (literal in the case of trades and figurative in the case of office workers), the value of personal relationships gained through enculturation and tenure in the workplace, and an acute awareness of workplace rules and the chain of command. Since these assets—the knowing of the “how,” the “who,” and the limits of getting things done—increase over time, seniority and “getting along” are highly regarded both by practitioners and by the system itself.⁵ The techniques of day-to-day practice (on a construction site, at a fire, in the classroom) were largely unwritten—passed through stories, lore, and situated peer-mediated experience. Coming up through the system is thus both an educative and a normative experience, which reinforces the workplace culture and draws clear boundaries between insiders and outsiders.⁶

Trades and services cultures are not identical, however. In the trades, work is tightly aligned to a literal code of mandatory performance-based standards. The work product—a retaining wall, a boiler, a main panel—and all of its components is visible, inspectable, and testable for form and function. In the uniformed services, however, the performance standards for what constitutes a good piece of work are less codified and objective and, partly as a result, cultural standards of behavior expand to fill the gap. In the case of the general services administrators who staff DOS offices, there are essentially no objective measures of what constitutes good work. The normative reference points are almost completely defined by “how we do things here.”⁷

The ongoing conflicts over how to most appropriately evaluate classroom teachers is an interesting tutorial in these distinctions among practice cultures. Historically, teachers were judged by their peers and principals primarily by observable characteristics. Their demeanor toward their students and colleagues, the condition of their classrooms, their temperament and degree of collegiality—in short, workplace norms made visible—were far more salient than academic or professional pedigree or student achievement. Given the undifferentiated professional path available to near-universally tenured teachers, “evaluation” on anything other than workplace norms would be beside the point.

Of the three work cultures I’ve described—trade/craft practice, with its objectively functional output standards; uniformed-service practice, with a generalized appreciation of good work gained mostly through the observation of deft performance and fit outcomes; and administrative service practice, with hardly any outcome standards at all—teaching would thus seem to fit most naturally into the second. Those in favor of test-based accountability, while claiming the goal of “professionalizing” teacher practices, are in fact advocating for outcomes standards more common in the manual trades, which would be a step down the perceived prestige ladder. At the same time, the stance by many unions that teachers should not, effectively, be evaluated at all can be seen as a striving toward the unaccountable administrative services culture, which they otherwise disdain.

The practice cultures of school-based employees like principals, teachers, aides, counselors, and others are very different from those of central DOS workers. First, their behaviors affect the work climate and conditions of their students and school co-workers to whom their days are intimately linked, but do not affect many others. While they affect relatively few people, they live with those

5. And highly rewarded, through the contractual instantiation of seniority privileges and time-based seniority steps.

6. See John Seely Brown, Allan Collins, and Paul Duguid, “Situated Cognition and the Culture of Learning,” *Educational Researcher* 18, no. 1 (January 1989): 32-42; and Hillary McLellen, ed., *Situated Learning Perspectives* (Englewood Cliffs, NJ: Educational Technology Publications, 1996): 19-44.

7. “Here” means not “in a contracts office” but “in this contracts office.” It is typical for DOS offices to regard their constraints and practices as unique, with little reason to look elsewhere for exemplars. This attitude is often bolstered with references to laws or regulations that may or may not exist. In contrast to corporate white-collar management philosophies, which attempt to apply universal principles and lessons from other sectors, DOS managers celebrate local exceptionalism.

people every day. This high us-to-them ratio imposes a level of social accountability that does not exist for central DOS workers whose actions or (or inactions) affect a great many more people but are much further removed from them.

Second, the consequences for those behaviors are much more immediate. Because educators work with people rather than manage processes, the feedback from those people is immediate. In contrast, the consequences of misfeasance or nonfeasance by a central DOS worker may not be felt for days, weeks, or months and even then only at a distance and diffused over many people. Few, if any of them, will have the cultural authority to lodge legitimated protests and so there is no feedback loop to communicate the damage done.

Third, the jobs of educators and other school-based personnel consist more of improvising around constraints imposed on them by policy or circumstance than of creating procedural policy that defines what other adults may or may not do, as is the case for DOS workers.

What is it about the DOS that lets it persist unchanged even though it is clearly suboptimal for the purposes of typical school districts?

All employees in hierarchical workplaces manage up to supervisors and down to subordinates. In bureaucratic cultures they also manage laterally to control the expectations of those from other organizational silos with whom they interact. This is particularly true for service center functions like the DOS, whose duties by definition relate to needs arising elsewhere within the organization. Its nominal job is to enable the policy goals of leadership or the work of those in schools, needs that are often urgent or gating factors to the viability or success of a project, for example, the need to have sensible data policies in place prior to shifting to a cloud-based instructional service.⁸ The fact that in many districts, legal or procurement or IT offices are “where ideas go to die” constitutes a serious impediment to routine execution, let alone reform or innovation.

As a new employee in a district or school, you quickly learn by lore, observation, and experience the norms of other practice cultures as well as your own. Part of what’s learned is hierarchy: yours within your culture and your culture’s relative to others. You learn what actions require permission, whether a non-response constitutes a “yes” or a “no,” and to whom one is required to respond promptly, if at all. You learn whom you may ask for service, whom you should ask for acknowledgment, and whom you must ask for permission. In organizations like districts, which juggle many complex dependent and time-sensitive tasks and whose workflows are constantly disrupted and interrupted by external forces, the acknowledged right to ignore communications is a mark of high status.

THE PERSISTENCE OF THE DOS

What is it about the DOS that lets it persist unchanged even though it is clearly suboptimal for the purposes of typical school districts, let alone those who are embracing more sophisticated approaches like a portfolio strategy or personalized learning? Is it that mayors, superintendents, and school boards don’t attempt to change it, or that they do attempt to and fail?

Up until now, the case has been almost exclusively the former. Mayors and school board members tend to campaign on issues and in the language of high-level policy: “Prepare students for the

8. “Nominal” because DOS managers tend to see themselves not as service-providing facilitators but as policy-proxy compliance enforcers.

When superintendents arrive in their new positions poised to deliver on the policy commitments of their sponsors, they are more than ever forced to rely on the installed base of DOS managers to “get things done.”

twenty-first century,” “Reduce Class Size,” “Increase Parent Choice.” The Superintendents they appoint naturally prioritize during their brief tenures actions that are seen by voters to mirror those campaign flyer promises. All parties correctly assume that most voters (and most editorial boards) would ignore detailed blueprints for the translation of goals into practice on the ground. Superintendent candidates appreciate that interview committees will have equally little patience for discussion of the daily details of getting things done, even though that is where policy succeeds or fails to work its change. In a sense, this is not unreasonable: why not assume

that a qualified, experienced superintendent candidate knows how to “get things done?”

According to what little research exists on the topic, superintendents don’t in fact know how to get things done, whether by “things” we mean improving student outcomes or keeping their own jobs. In fact, the differences attributable to superintendents are smaller than for any other input, including measured and unmeasured student characteristics, teachers, schools, and districts themselves.⁹ Either superintendents are doing the wrong things (their policy objectives are flawed) or they are doing things wrongly (they don’t change practice). While the former is to some degree unknowable the latter has straightforward explanations.

If my core premise is correct (that the DOS work cultures through which policy must flow are different from the cultures of both schools and of private sector managers), then most superintendents are outsiders to DOS practice with scant expert knowledge of or legitimacy in the ways of “how we do things here.” For starters, they are generally not from “here” (nor will they be here long) and so start with no currency in the informal economy of the workplace they ostensibly manage.¹⁰ Second, most superintendents’ careers originate either in school principalships, in schools of education policy or instructional tracks, or, more recently, in Fellows programs like those sponsored by the Broad Foundation.

In none of these will they have been immersed in the cultures and practices of contracting, procurement, or IT. They will not be able to engage in those discussions with authority born of experience or situated legitimacy. If, on the other hand, they have come up through teaching and principalships, they will have absorbed there the lessons taught by daily experience that DOS functions exist to enforce compliance rather than to solve problems and also that DOS workers mediate arcane risk-laden legal or technical operations that are beyond the comprehension of mere educators.

When superintendents arrive in their new positions poised to deliver on the policy commitments of their sponsors, they are more than ever forced to rely on the installed base of DOS managers to “get things done.” There is little time or inclination to argue with those managers’ assumptions and work flow structures and not enough factual knowledge to win those arguments. It is not too

9. Matthew M. Chingos, Grover J. “Russ” Whitehurst, and Katharine M. Lindquist, *School Superintendents: Vital or Irrelevant?* (Washington, DC: Brookings Institution, 2014).

10. This is compounded when they bring with them seconds-in-command who displace longer-serving administrators with more social capital.

much to say that DOS administrators manage up to district leadership and laterally to those for whom they are supposed to perform service-center functions through classic obfuscation and fear, uncertainty and doubt (FUD) strategies.¹¹ It is common practice for offices like IT, general counsel, or procurement to refuse to take an action, claiming it is forbidden by contract or statute when in fact it is only their preferred modes of operation that stand in the way. Ironically, those who come to superintendencies from backgrounds like business or the military often assume that the DOS is built to be responsive to them and find out only too late that this is not the case, after foundered initiatives have damaged their credibility.

LEGACY DOS VALUES AND PRACTICES

DOS workers are seldom included in initial discussions where they could offer early warnings of potential contracting hurdles and requirements.

The DOS encompasses nearly all central office functions. Procurement and contracting, for instance, are powerful examples of DOS functions that, though generally ignored by leadership and policymakers, are consistent sources of frustration for those responsible for the work of schools: educators, outcomes-focused central office teams, and vendors and researchers who require contractual arrangements with the district.¹² There is a wide gulf between what DOS workers believe they are striving for and what those who deal

with them inevitably experience. This mutual incomprehension across practice cultures creates hostility and reinforces insularity, further widening the gulf between those who are responsible for outcomes and those who are supposed to support them.

Legal and procurement administrators do not generally start with the goal of making things difficult for potential contractees. They see themselves as conscientious administrators of the public trust, ensuring that public resources are wisely spent, that all vendors or other contract recipients are on an even footing, and that contract provisions do not violate district policies.¹³ In their eyes these core normative values can be characterized as “Stewardship,” “Fairness,” “Value,” and “Compliance.”

As abstractions these values are unobjectionable. Problems arise, however, when rather than being directed toward policy ends they become ends in themselves and are further operationalized according to very narrow interpretations. When that happens, “stewardship” is warped into risk-avoidance, “fairness” into a standardization that ignores circumstantial realities, and “value” becomes synonymous with lowest cost. “Compliance” becomes perhaps the most frustrating ethos of all, a hybrid of “the way we do things,” “because I say so,” and a solicitation to other parts of the organization to surface any discomfort that can serve as a reason to refuse the contract or to extend and complicate the process. Rather than facilitating or—even better—building capacity for dynamic problem solving throughout the organization, these offices model constraint-seeking behavior to schools as well as centrally, thus actually diminishing the capacity of districts to fulfill their mission.

Since the contracting office is not part of districts’ accountability loop for academic performance (or for other high-level key performance indicators like stakeholder satisfaction) and since it does

11. See Wikipedia, “Fear, uncertainty and doubt,” last modified on April 15, 2015.

12. For the gulf between DOS and vendor perceptions of current practice, see Digital Promise, *Improving Ed-Tech Purchasing* (Washington, DC: Digital Promise, 2014).

13. The public resources which they guard include their own limited time, so wherever possible they will seek to batch-process requests and/or offload as much work as possible onto the applicant. This includes the work of maintaining communication and updating status, a major source of frustration for contractees.

not regard vendors or educators as customers (rightly so and despite jargon to the contrary, because customers by definition have choices of whom to deal with), there is little incentive for these offices to act differently or to embrace a problem-solving mode. In this sense their behavior is fully rational even though it leads to outcomes that are adverse to universal leadership goals of improving student outcomes and stakeholder satisfaction.

For example, because they are not regarded by their instructional colleagues as constructive members of problem-solving teams, DOS workers are seldom included in initial discussions where they could offer early warnings of potential contracting hurdles and requirements. It is not uncommon for teams of all kinds to proceed some distance down a planning path only to discover that the contracting and procurement policies will not enable them to execute on schedule. This in turn leads to the hasty formulation of suboptimal Plans B and C that can actually bring about the failure of the initiative. When this happens, both the instructional stakeholders and the DOS workers absolve themselves of responsibility, blaming “the rules” rather than the culture of compliance which privileges rules to the extent that they are seldom even questioned, let alone authenticated.

I spoke with an HR recruiter who had stopped doing business with the New York City Department of Education. Her reason was that the DOE’s IT department had such an inflexible and user-hostile application process that only candidates with weak employment optionality would participate. It was undesirable to her to deal with those kinds of candidates or that kind of employer and so, like her better candidates, she fired the DOE as a client. We know anecdotally that this is common for vendors of all types but data is hard to come by since, unsurprisingly, DOS departments do not track the efficiency of their recruiting or contracting pipelines.

This isolation of DOS workers from the real work of systems and schools has several direct consequences. First, educators and instructional offices are denied access to tools they need to help them with their work, undercutting both their results and their sense of professionalism. Second, vendors with choices to do business elsewhere will do so (particularly newer, smaller, more innovative companies not accustomed or resourced to endure a protracted and frustrating process), leaving the district with a smaller and less desirable vendor pool. Third, the energies of all parties are expended on inefficiencies that do not lead to better process or outcomes. Fourth, those participants (vendors and educators) who do persevere to a contract learn important lessons along the way about the low returns on initiative, lessons they are likely to incorporate into their future behavior.

What all of these suboptimal DOS practices have in common is an unbalanced sense of caution derived from a fundamental misunderstanding of risk and how to manage it, as well as a frame of reference that exaggerates compliance and scandal-related risks and ignores risks of substantive failure. Risk is an aspect of the chance, uncertainty, and unpredictability associated with every action and every circumstance. All enterprise (and all daily activity) would be impossible without the ability to judge whether the likely cost/benefit ratio of a new approach is greater than the cost/benefit ratio of the status quo. Since nothing is without cost or risk—including familiar methods and habits—organizations that have freedom of action and that optimize for some kind of return continually evaluate their existing practices and outcomes as part of the analysis and management of risk and expense. In districts, current DOS practices are generally regarded not just as the-devil-we-know but as if they are actually cost- and risk-free, especially by those that manage them.

One of the core characteristics of the DOS is that it does not routinely quantify the costs, outputs, or risks of its own operations and is seldom asked to do so by district leadership. When it does, “costs” and “outputs” tend to be defined through simple ratios like personnel costs divided by operations, rather than by more useful contextual measures like value generated, opportunity costs, or customer satisfaction. This is perhaps not surprising since DOS functionaries often believe they have little freedom of action to do differently (though this is mostly untrue) and districts almost never optimize for anything (despite rhetoric to the contrary): under those conditions there is little point in measuring and analyzing. However, it is more valid to say that unless measurement and analysis become the norm we will not see an improvement in DOS benefits and hence in student outcomes and stakeholder satisfaction.

Any proposed alternatives to Standard Operating Procedure are thus viewed with great skepticism and with much greater emphasis on the theoretical downside than on the importance of the desired outcome. This bias both reflects and reinforces doubly irrational levels of confidence: unjustifiably high with regard to SOP and unjustifiably low in practice that is non-standard. This in turn reinforces the poor assessment of risk profiles, feeding back in a virtue-less circle that can only be broken by applying new incentives and close oversight, along with leadership that is willing to take the compliance risk on itself in a very public manner.

It is important to remember that nearly every problem was once the solution to another problem.

It is important to remember that nearly every problem was once the solution to another problem. Municipal bureaucratic cultures, of which districts are one manifestation, are a response to the welter of conflicting “Good Government” impulses that arose early in the twentieth century as a reaction to financial corruption, political

opacity, and cronyism. To this day Good Government bureaucratic methods and assumptions continue to reflect the tools, systems, and behavioral norms of the era in which it was born. For example, if the problem was perceived to be too much discretion in awarding contracts, the most efficient way to address it given the information systems available was to publicly elaborate a set of requirements and procedures from which officials could not deviate. If the problem was perceived to be inadequate or inappropriate contract deliverables, then the best remedy was a detailed list of requirements to which the product must conform. If the problem was an incompetent municipal workforce hired and fired on patronage, the remedy was a more or less permanent class of professional managers to be hired and rewarded with as little discretion as they themselves would be permitted to exercise in their jobs. Thus, industrial/progressive values of uniformity, fungibility, and compliance became administrative technologies, the hallmarks of municipal and district operating systems, policed by a popular press alert for the kinds of scandal and impropriety that could be drawn in broad strokes.

Rigidity vs. Dynamism

A great deal has changed during the past century, and particularly in the past 20 years. Our operating ideals have shifted from mass uniformity to mass customization. Our products and tools are more likely to be made up of bits than atoms, and we have come to embrace the immanence of uncertainty and the experimentation and ongoing learning that derive from it.¹⁴ At CRPE, we call this iterative approach to change in response to changing conditions “dynamism.” Its hallmark is an openness to new approaches and ideas whatever their source, and an embrace of change when change is called for.

Systems that can self-heal do not need to be bulkily overbuilt to guard against failure.

Dynamism understands that the best way to manage the risk of suboptimal outcomes is not to plan and specify ever more heavily at the outset but to leave open space for unexpected discovery and iteration once underway. Systems that can thus self-heal do not need to be bulkily overbuilt to guard against failure. At the same time, the

goods and services on which schools rely to fulfill their objectives, as well as the objectives themselves, have come to proliferate and evolve at extraordinarily rapid rates, well beyond the ability of legacy processes for problem definition and solution sourcing to keep up.¹⁵ Even more fundamentally, the notion that we want all educators and students to be using the same set of tools and learning objects is nearly extinct: the modes and reflexes associated with personalized learning are by their nature at odds with the cumbersome, heavily pre-specified discovery and acquisition processes which DOS culture still requires.

These attitudes of rigidity and compliance (as contrasted with the problem-solving orientations of flexibility and responsiveness) can so set the tone of district culture that they end up shaping instructional and analytic work far removed from DOS functions. Given that, during this same period, we woke up to the fact that our school systems were not serving the purposes society has set for them and that experimentation and problem solving are necessary in order for them to do so, any essential aspect of the system that resists experimentation is a threat to the overall fundamental legitimacy and viability (for an example, see box on the next page).

This system worked well at reducing the most primitive, egregious forms of corruption and self-dealing. It was well suited to procedures in emerging regimes like licensing and permitting that needed to be performed in an identical manner hundreds of thousands of times, and to health and safety codes where the potential harm is great and standards of best practice are slow to change. Goods procured in this manner were mostly either commodities or items that would be functionally identical if they met the performance specifications drafted by those responsible for the success of particular projects. Overall, it reflected perfectly the theory of action of an industrial society.

14. One way to characterize this might be as a shift from the values of manufacturing to those of science. The former starts with an answer that is known and seeks to replicate it, the latter with a hypothesis that is contingent and seeks to disprove it. See also Steven Hodas, “Technology Refusal and the Organizational Culture of Schools” in *Computerization and Controversy: Value Conflicts and Social Choices*, ed. Rob Kling, 2nd edition (San Diego, CA: Academic Press, 2nd edition, 1996): 197-218.

15. This discontinuity between the rate of change and the ways of procurement sometimes results in amusing ironies. When districts make very large purchases for hardware or even software they often are compelled by budgeting policy to use capital rather than operating funds. The use of capital funds generally requires a five-year lifespan for the purchase, which forces districts to enter into unusually long software contracts (to the delight of vendors) and prohibits the upgrading of equipment that is two or three generations old, even if new funds become available, since its purchase was contingent on that five-year lifespan.

For an NYCDOE project to help families make better high school choices, we sought to release anonymized data on where NYC middle school students end up attending high school. The data consisted of approximately 100,000 cells of middle school/high school student dyads, with each cell containing the number of students from a given middle school who went on to attend a given high school. There were no student identifiers of any kind, just column headers of middle school names, row headers of high school names, and cells containing digits with values from 0 to 36. The legal department, citing FERPA requirements, arbitrarily stipulated that any cell containing the number 10 or lower be redacted. Following this requirement would have meant redacting 88,000 of the 100,000 fields, rendering the data essentially useless, but no one in either the legal or research departments could come up with either a rationale or documentation of that requirement. Though the US Department of Education’s chief privacy statistician suggested an approach that would have meant redacting only 8% of the data rather than 88%, neither the research or legal staff wished to be responsible for a change in policy and so the project died there.

The New York City Department of Education DOS Experiment

The NYCDOE’s Office of Innovation (the “iZone”) was established as an R&D lab for personalized learning. By the time of my departure in 2014, it had grown to encompass 300 schools, each of which had opted in to varying degrees of school-driven transformation. The iZone theory of action rested on three pillars: working in schools to show educators how to practice differently, working on the policy changes at the district, state, and federal levels that would enable those new practices, and working in the marketplace through “smart demand” to stimulate the development of better tools for educators to work with. Since the policies, practices, and tools for effective personalized learning are at a very early stage, progress in each is based on an emergent set of hypotheses and demonstrations at the school, district, and ecosystem (e.g., vendors, funders, local and state government, and families) levels. Necessarily they rapidly proliferate and quickly evolve or wither.

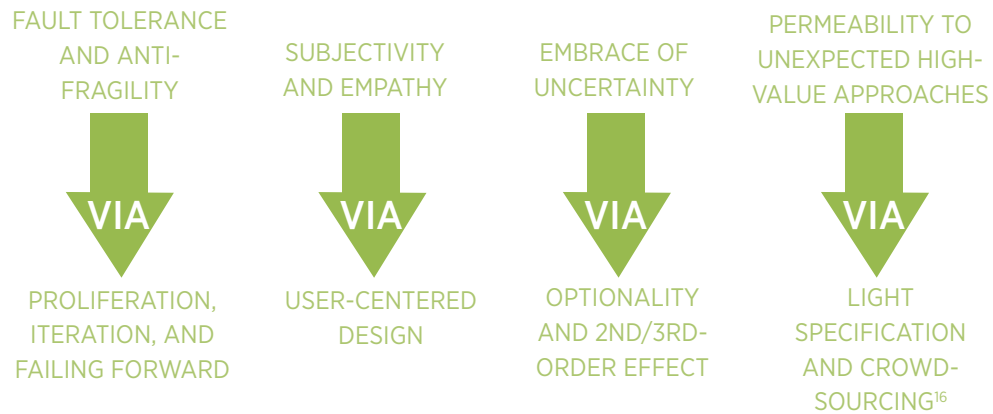
The ways in which nominal DOS values have become ossified practices, such as

“Stewardship”	becoming	<i>Risk avoidance</i>
“Fairness”	becoming	<i>Standardization</i>
“Value”	becoming	<i>Lowest-Bid Purchasing</i>

result in a heuristic that is suboptimal to support the learning and refinement that are necessary to move forward. Decisions cannot be made flexibly or rapidly enough and the processes are simply inadequate to deal with the types and volumes of products and services entering the market. These modes, particularly as expressed at the district level, were not functional for the world we’ve known, let alone the one that is emerging. As the iZone work progressed, it became clear that we had to engage with central office DOS workers to teach them new practice habits just as we were doing for educators in schools.

In response, we sought to create exemplars for the replacement of the static District Operating System (sDOS) with a dynamic District Operating System (“dDOS”) that could become as pervasive and determinative as what it was replacing but that would be able to much more quickly define and solve problems as experienced by practitioners and stakeholders responsible for or affected by the work whether at the classroom, school, or district levels.

THE VALUES AND PRACTICES OF THIS NEW dDOS ARE:



The most pernicious second- and third-order effects of the sDOS derive from the learned helplessness it induces in those who would otherwise pursue improvements. This results in the most potentially high-value solvers (among educators, vendors, or central workers) opting out and neither contributing to the work nor acting as a spur to change. The dDOS was therefore designed to be more responsive to the human needs of both workers and the subjects of their work. It was also designed to generate insight, pleasure, and other benefits along the way even if the process was aborted or the end result not successful at achieving a sought-after outcome.¹⁷ Simply put, by making the process itself responsive and rewarding we increase the likelihood of future participation and hence future success. The best way to succeed is to try often. The best way to get people to try often is to treat them well when they do.

In the NYCDOE GapApp Challenge for middle school math, the central office assumption was that the most pressing classroom problems were curricular. When we interviewed and held design sessions with teachers, however, none of them mentioned curriculum. What surfaced for all of them was the difficulty in dealing with the range of abilities within a single classroom, something that was not even on the radar at the central Office of Teaching and Learning.”

Research and anecdote confirm that educators generally feel that the tools and materials provided by districts are inappropriate or insufficient for the tasks at hand. This is not surprising given that educators are seldom an integral part of the problem-definition and solution-sourcing processes through which those tools are acquired.¹⁸ Of those two, problem definition is the more critical since it determines everything that follows. Unfortunately, it is also the area in which central office administrators are most likely to be inappropriately confident in their understanding of what needs to be solved for. When the acquired solutions are inevitably off target (to a small or large degree, again due to inherent margins of human fallibility), the

lack of process inclusiveness reinforces educators’ tendency to reject approaches that are “tossed over the wall” and disinclines them to find any benefit. A user-centered design approach, however,

16. Note that in contrast to legacy DOS values, the dDOS is more concerned with creating generative high-value processes than it is with enforcing a scope-and-sequence code. Its goal is to multiply possibilities rather than to reduce them.

17. This is the inverse of many DOS processes, which frustrate stakeholders along the way even when the outcome is successful.

18. Digital Promise, *Improving Ed-Tech Purchasing*.

brings teachers (or parents or whoever the stakeholders may be) into the most formative phase of the project, a “solve-with” approach, rather “solve-for,” that creates a strong sense of shared responsibility. When the outcomes are suboptimal (again, given fallibility) the stakeholders now have strong incentives to make it work. The process is self-healing rather than self-harming.

At the iZone I undertook a number of experiments in re-conceiving DOS functions, working in partnership with central offices responsible for family- and educator-facing functions like

Characteristic user-centered design replacement values include “design with” vs. “design for,” “users as subjects rather than objects,” “provocation” vs. “specification,” “respond to” vs. “react to,” “motivated by delight” vs. “accepted through compliance.”

curriculum, transportation, and school choice. The goal was to get these DOS workers to redefine their practice by engaging in projects that fulfilled existing requirements and deliverables but would be performed under new assumptions and in new ways. Our hypothesis was that by shifting their orientation from compliance to problem solving, they would produce work that would be more inherently rewarding to them and more well received by users. We believed that this mode would also generate second- and third-order effects as these usually isolated workers engaged with new partners who would bring their own fresh perspectives and practices inside the organization. Most importantly, we wanted them to experience first-hand that it was possible to operationalize their nominal values (e.g., “Fairness”) without automatically invoking the implicit negative assumptions (“Standardization”) that were narrowing their field of action.

An early step was to get central DOS workers out from behind their physical and psychological isolation from potential collaborators. The object was, on one hand, to replace (or at least to infuse)

Siting a DOE team at a non-DOE facility was unprecedented and constituted our first major struggle against the DOS. The DOE had never rented office space before, let alone co-working space where the business and legal terms resemble a subscription more than they do a commercial lease. The internal negotiations took many weeks but—to the DOE’s credit—we were ultimately successful in the argument that our programmatic purpose required us to be embedded in and accessible to the community of early-stage entrepreneurs and service designers.”

the secretive and adverse default mentality with one that could accommodate dialog and empathy and, on the other hand, to have them shed light on organizational processes and norms that are opaque and mystifying to outsiders. We did this by establishing a series of informal “Meet the DOE” conversations at General Assembly’s New York campus where our team was based. In these afternoon chats, held in a circle over coffee and cookies, DOE staffers from offices like procurement and curriculum explained to small groups of ed-tech startups how they go about their daily work, how they think about their challenges, and how they engage (or would like to engage) with other DOE offices and outside partners. The entrepreneurs for their part had the opportunity not only to get answers to questions that would have taken weeks or

months through typical channels but also to get a glimpse of the underlying organizational logic with which they would have to deal, and the imperatives which govern DOS decisions, rational or otherwise.

This may seem trivial in the context of all the procedural and (perceived) regulatory forces that shape DOS behavior, but it was a critical proof point for the benign and useful nature of non-

One of the most significant shifts in the research of public and private sectors over the past ten years has been the embrace of crowd-sourcing from “non-expert” providers.

standard modes of engagement. Since behavior change in cautious politicized organizations is scaffolded on such proof points, these simple afternoon discussions laid important groundwork for more radical and more public demonstrations of alternative heuristics.

For example, one of the most significant shifts in the research of public and private sectors over the past ten years has been the embrace of crowd-sourcing from “non-expert” providers. This

is often implemented through open ideation and product challenges and other modes of semi-formal, widely publicized, and lightly specified solicitations. The goal is to cast an unusually wide net for potential respondents while leaving room for creative interpretation of both the problem and the potential solution. This approach has proven effective across many practice domains from health care to social service policy to engineering. Replacing *specification* with *provocation* hedges against the inherently limited perspective and inevitably flawed assumptions of the issuer by allowing the crowd to fill in conceptual gaps and route around institutional solution bias.¹⁹ It is a nearly cost-free mechanism to manage risk that simultaneously decreases liabilities while increasing the number and scope of potential wins. It was, typically, unknown in K-12.

Through the iZone’s Innovate NYC Schools project we conducted a number of high-profile open challenges that built on the “Meet the DOE” conversations to demonstrate to central office stakeholders that it was possible to approach their work in ways that seemed unorthodox and unproven and still be successful. The formats and topics of the challenges were purposefully varied (middle school math, music education, and tools for school selection over a weekend, eight weeks, and five months) in order to reinforce that this approach was not a template to be “scaled” but a set of values and a heuristic that could be brought to bear in many contexts. In each instance we intentionally incorporated core elements of uncertainty and risk and publicly emphasized—rather than played down or obfuscated—that this was a series of hypothesis tests, which might prove us wrong.

Each of these challenges was successful against the explicit criteria of participation, outputs, and user satisfaction. Just as important, however, were the messages of support and legitimation from the media and political leadership that enabled this to become a wedge and a fulcrum to further displace the sDOS. This culminated in the chancellor at the time, Dennis Walcott, issuing a “Chancellor’s Challenge” to every NYCDOE office to submit particularly difficult problems to which we would then apply these and other dDOS methodologies. For flanking support, the then-COO was preparing to revise the default procedures of functions like contracting, procurement, and IT policy so that they would enable rather than thwart these new tools and assumptions of dynamism, responsiveness, and user-centricity. As the NYCDOE had led several groundbreaking efforts in the recent past, so we were on the verge of instantiating the first modern District Operating System.

Then an election happened.

Within weeks of her appointment by Mayor DeBlasio, the new chancellor (a 72-year-old Board of Education lifer who proudly represented a rejection of the dynamism that had characterized the

19. Discovery processes like RFPs that are heavily pre-specified carry three deep ineluctable risks that derive from basic human fallibility. The first is that if the specification does not well capture the actual problem (as opposed to the problem as perceived by DOS administrators) any potential solution will drift well off the downrange target. The second is that solutions which might be appropriate for either the described or actual problem but do not match the specification will either self-reject or be rejected. The third is that since the contract requirement is the meeting of the (likely flawed) specification rather than the solving of the problem, the process cannot later self-heal.

The DOS has endured for so long precisely because—rather than optimizing for any one stakeholder’s set of high-level interests—it offers to all stakeholders a stable set of third-best expediencies.

Bloomberg/Klein regime) made it clear that her own theory of action was to return every level of the district—classrooms, schools, local districts, and central office—to what she had remembered. She dismissed or forced out most of the senior leadership and brought out of retirement old friends to fill their shoes. Entire divisions that had been born under Bloomberg and Klein were quickly bled out and the moribund Division of Teaching and Learning, similarly bled by Klein while she was its leader, regained its prominence. There was a rapid purge of those who had entered government service under Klein in favor of those

to whom the chancellor had personal ties or whose loyalties could be otherwise vouched for. The word “vendetta” was often heard.

In any political transition, work practices, especially those related to operations and service centers, tend intentionally to be left alone (provided they are not politicized, an obvious embarrassment or an obvious impediment) so that they can smoothly enable (it is hoped) the goals of policy on which the newly elected tend to ride. This gives the managers of those offices a great deal of power at a formative moment and, to the degree they feel threatened, a chance to fall back and regroup. During the leadership transition, we at the iZone were told directly by a mid-level member of one of those offices, “No one is going to do anything for you anymore.” This was sadly ironic, since our work was deeply respectful of the subjectivity of educators and parents, two groups which often felt disregarded by the Klein administration and whom the new chancellor claimed to respect.

In sum, there was a rapid, thoroughgoing turnover in political leadership, senior staff, culture, mission orientation, and theory of action. This meant that the iZone had none of the political capital that would be required to carry out the next phase of work, the phase that was required to move our nascent modernization from promising-but-isolated curiosity to mainstream modus operandi. We had not yet had enough time or enough reach for the practices to peruse the organization, and when the political and cultural pendulum swung back, they were largely swept aside. While several of the values and practices we demonstrated did take shallow root in those parts of the central office with which we’d had the most engagement, it would be hard to notice unless you knew where to look, and then looked hard.

What Can Be Done?

Given this example of snatching defeat from the jaws of victory, it can be difficult to envision conditions under which the DOS is replaced with something more generative, effective, and humane that, crucially, will persist through changes in leadership. The DOS has endured for so long precisely because—rather than optimizing for any one stakeholder’s set of high-level interests—it offers to all stakeholders a stable set of third-best expediencies. There is an example, however, of equally enmeshed, equally failed, equally pessimal conditions being profoundly reset, and that is the U.S. auto industry in the 1980s.²⁰

At that time, relationships between General Motors (GM) and the United Auto Workers (UAW) union had degenerated to the most adverse and shortsighted levels imaginable. The overriding goal—to produce cars that people actually wanted to buy so that workers could have jobs

20. Wellford W. Wilms, Alan J. Hardcastle, and Deone M. Zell, “Cultural transformation at NUMMI,” *Sloan Management Review* 36, no. 1 (Fall 1994).

and management could have profits—was reflected nowhere in daily practice. At the Fremont, California plant, built as state-of-the-art in 1962, daily absenteeism rates were 20 percent, drugs and alcohol were freely available on the shop floor, and sick-outs, slow downs, and wildcat strikes were common. Management was adversarial and heavy-handed. “The only time the two sides came together was to negotiate a new contract. Detailed job descriptions and wage rates, negotiated in an atmosphere of mistrust, defined human roles impersonally and contractually.”²¹ Finally, in 1982, the Fremont plant closed and 6,000 workers lost their jobs.

This abject, utter, distributed failure created an opening for a new joint venture between GM and Toyota, and for the UAW to reimagine and create a modern “Industrial Operating System” in which management and labor explicitly rejected nearly every “non-negotiable” and “untouchable” assumption that had previously defined their understanding of their shared endeavor. The new venture, NUMMI (New United Motor Manufacturing, Inc.) was a conscious attempt to create a new culture from the ground up while drawing on the decades of accumulated manufacturing expertise of the workers. Among a multitude of changes, work rules were simplified or eliminated,

We believe that districts are now in a position analogous to that of the American auto industry in the 1980s, and that an analogous reinvention of the operating system is required...

52 job classifications were reduced to 3 and a no-layoff policy was instituted. Within a year after re-launching, absenteeism was reduced to 2 percent. After 10 years, productivity had more than doubled and many of the highest-quality cars and trucks built in the U.S. were coming out of the Fremont plant.

UCLA professor Wellford W. Wilms highlights three elements that were essential to this cultural re-engineering.²² First was a force that was great enough to induce change and unfreeze the organization. Second was the presence of a dominant partner willing to take on the

responsibility to lead the others toward new organizational practices. Third was the willingness to forego pure implementations that would make the best the enemy of the good in favor of pragmatic 80/20 compromises that built empathy and trust amongst the stakeholders.

We believe that districts are now in a position analogous to that of the American auto industry in the 1980s, that an analogous reinvention of the operating system is required, and that Wilms’ three conditions are either present or can be made to be so.

As with all deep system change, improving the DOS will require commitment and perseverance on the part of leadership—in this case the superintendent. It must be not just an attack on bureaucratic culture but a change of deep strategy that permeates the entire organization. Unlike many recent reform initiatives, however, first the change needs to be worked on some of the most senior members of the central leadership team rather than on employees at a lower level of administration or those based at schools. It requires that superintendents be willing to immerse themselves in areas of operation in which they have little expertise and which are less glamorous than high-profile battles over accountability, curriculum, and union contracts. It requires that they recalibrate their own notions of risk and return on investment in order to properly model for central staff the iterative, transparent approach to improvement that is the essence of dynamism. Finally, it requires the willingness to replace senior central office personnel who are unwilling or unable to embrace the new frameworks.

21. Ibid.

22. Ibid.

Although this type of engagement is not widespread, the few instances where it has taken place demonstrate the potential for transformation. In Washington, D.C. and New York City, for example, the administrations of Michelle Rhee and Joel Klein recognized the need to transform HR functions and capabilities from satisficing to strategic.²³ Though each worked from differing contexts, constraints, and goals, their approaches shared four key attributes.

1. **High level of authorization.** They assigned talent management to a senior reform executive with broad powers.
2. **Deep interplay of policy and practice.** By separating yet yoking strategy and routine transactions, they were able to make visible near-term change while moving along the longer arc.
3. **Redesign policies and practices for flexibility.** They recognized the need to meet the marketplace on its terms, not theirs.
4. **Re-culture HR to focus on performance.** They recognized that service centers play a crucial strategic role in the success or failure of policy initiatives.

The vocabularies, conceptual frameworks, and tools required to support these types of changes are likely to be unfamiliar to superintendents who have come up through district instructional channels or through policy-focused preparation programs (note that both Klein and Rhee did not

Old-DOS resilience is in large part the triumph of habit.

participate in such programs). They, as well other C-level executives, will need training and support to guide their decision making and the frameworks they establish for subordinates. These values and practices cannot be delegated or relegated

to an “innovation officer.” If they are to perfuse the organization—as they must in order to be consequential—they must emanate from a CEO who holds herself and her senior leadership as accountable for this transformation as she does for student outcomes.

Because these are new modes of engagement that lack venerable practice-culture validation, they will require a support model that, unconventionally, cuts across geographic boundaries as well as those that, even within regions, isolate school leaders from those in other sectors also striving to make change. As in other professional practice communities the distinctions between training, support, and research and diffusion should overlap and blur over time but they need to be thoughtfully architected in order for that blurring to take place.

The training to diagnose and reboot the DOS would ideally be integrated as a curriculum track into existing leadership development programs for district and school leaders. The scope and sequence would encompass organizational and management theory as well as design thinking, innovation practice, enterprise architecture, and the unique histories and anthropologies of municipal culture. It would be organized around case studies and punctuated with frequent project work in marketing and communication, product design, and ROI and total cost of ownership analyses. This curriculum would be created with an eye toward modularity and productization so that various subsets could be delivered asynchronously and self-paced to the large potential audience of education policymakers and practitioners currently in place and longing for change.

Old-DOS resilience is in large part the triumph of habit. Its replacement can only come about by instilling and grooving new habits that displace, rather than defeat, the old through ongoing reinforcement and repetition of new behaviors. While a superintendent can model, evangelize, and

23. Christine Campbell and Michael DeArmond, *Talent Management in Portfolio Districts* (Seattle, WA: Center on Reinventing Public Education, 2010).

reward the dynamic engagement with evolving circumstances that is at the heart of the new DOS, she cannot be in all offices at all times peering over shoulders, editing workflows, unscheduling meetings, and insisting on experimentation, short-cycle iteration and stakeholder validation. Therefore, leaders who are serious about this work will need to engage and embed support partners in their central offices whose role it is to make those nudges, be those ombudsmen, model the innumerable daily performances of this-not-that. At the outset there will be few individuals or organizations who can fill this role who will not themselves require training, so part of curriculum development and recruitment must focus on this nascent cadre who will be the thin edge of the practice wedge driven by leadership.

The dynamism required of a new DOS to fulfill the twinned potentials of personalized learning and a professionalized educator corps cannot be achieved within traditionally walled-off districts: it is precisely this isolation—and the recessive traits it selects for—that need to be breached. Support for DOS change must therefore go beyond familiar forms of professional development and technical assistance. It must also foster the organic flux of ideas, collaborators, and theories and modes of action across the membrane that separates LEAs from the changed worlds around them. This requirement is twofold. First, DOS workers (like everyone) require exemplars on which to model their behavior, and these are richer and more numerous outside the membrane. Second, an essential component of reformed DOS practice is a shift in identification to embrace a wider peer community of “solvers” that has different traditions and expectations of performance.

The ideal site for this social-cultural-professional cross-pollination is an Education Innovation Cluster (EIC). EICs are geographically based social/professional hubs of education practitioners, entrepreneurs, researchers, investors, and community members focused on engaging the problems of schools through better tools and practices. Though there may be formal relationships between the parties in practice, they are analogues of classic “third places” in their informality, “ownership” by the practice community rather than institutions, and the serendipitous, generative, and collaborative nature of the relationships formed there.²⁴ Having districts participate in their formal capacity and district employees participate in their autonomous capacities in local EICs is an organic and efficient way to support the new attitudes and practices expressed in the curriculum. “Technical assistance” is thus developed and embedded in the community, where it is validated and strengthened through personal relationships rather than purchased as a commodity from “experts” who have no ongoing stake in the outcome. As EICs proliferate and become loosely networked they will also serve as living repositories of best practices so that long-standing academic boundaries between practice, research, and dissemination usefully blur.

24. These qualities map to the habits and values that inform a reformed DOS. The logic of innovation clusters and hubs more broadly is to function as a kind of coral reef, a vibrant hub that attracts and nurtures an increasingly diverse array of creatures.

Conclusion

Education, perhaps more than other areas of government, will always be a site for policy change, if for no other reason than that is how authoritative actors exercise their authority. If policy is thought of as the destination toward which schools strive, then clearly they must be properly conditioned

If policy is thought of as the destination toward which schools strive, then clearly they must be properly conditioned and equipped for the journey.

and equipped for the journey. It is not only or even mainly that schools do the wrong things *but that they do things wrongly* no matter the objective. And while we have spent a decade focused on the capacity, motivation, and practices of teachers and principals, the much more consequential DOS actors (who have more leverage by virtue of their central positions) have largely escaped scrutiny and are part of no accountability loops or feedback systems, despite mostly lacking contractual protections.

Compared with most of the policy-driven reforms of the recent past, there are relatively few regulatory supports required to enable dynamic problem solving. We know the values and practices necessary for school systems to achieve much greater levels of dynamism in their problem solving. We know how to begin to instill them and how to iterate as we proceed. It is in our power to make these changes; so far we have simply chosen not to. But the changes we hope to achieve in the classroom are not possible without it.