Trading Silver Bullets for Systemic Change: Education Innovation and Induction Clusters

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Executive Summary

K-12 education in the United States faces three major challenges that persist despite decades of policy initiatives designed to address them: lagging student performance with respect to other developed nations, growing shortages of qualified teachers, and deep inequities in outcomes associated with family income, race, and ethnicity. We propose a single bold solution to all three challenges: Innovation and Induction (i2) Clusters. An i2 Cluster is a group of elementary and secondary schools located in a significantly underserved area of a district. Like teaching hospitals in medicine, i2 Clusters would be designated as schools where master teachers mentor new teachers and collaborate with researchers in an i2 Partnership to develop and test innovative practices. And, as in teaching hospitals, i2 Clusters would be places where excellent practice and mentoring both catalyze new research and respond to its findings.

The intensive support for new teachers, including a full year working as a resident alongside a trained mentor and a second year with weekly mentoring sessions, would dramatically reduce the number of teachers leaving the profession in their early years of teaching. Locating the Cluster in the lowest-performing schools would reduce the inequitable access to effective and experienced educators and would place two adults in classrooms that stand to benefit most from additional teacher attention. Designating the i2 Clusters as sites for researchers to work with practitioners on research-based innovations would provide contexts for addressing barriers to higher academic performance, such as ensuring that all students can read with comprehension by 3rd grade and that instructional practice effectively integrates social and emotional learning with the teaching of disciplinary content. The ongoing collaboration between researchers and practitioners in an i2 Partnership will produce strong new connections and redirect the focus of many of our nation’s most accomplished academic experts to urgent national needs. Their direct work with i2 Cluster schools will allow these challenges to be addressed in ways that respond to the complexity of the classroom, while providing the sustained attention required to create solutions that work for both students and teachers in U.S. classrooms.

Each district-based i2 Cluster and its Partnership with universities and other institutions would be locally operated by an i2 Center. Networks that link i2 Centers would be established to facilitate and accelerate continuous improvement, allowing work on a particular problem in one location to be informed by work to address that same problem elsewhere. A national i2 Network hub would be charged with supporting capacity building, knowledge accumulation, and the spread of innovations across sites. But, importantly, a local governance structure for each i2 Partnership would limit the national role to one of informing and enhancing local efforts.

What would such an initiative cost? The answer depends entirely on the scale of the enterprise, the arrangements that can be made with teacher training programs to integrate student teaching and induction, and the reallocation of resources currently available for related
activities. A metropolitan school district that serves 30,000 students and hires 30-40 first year teachers has begun planning for an i2 Cluster in three of its lowest performing schools. That district’s estimated annual costs are approximately $6 million. Rough estimates for a second demonstration in an urban district that is twice the size would exceed $20 million annually, because the percentage of new teachers in that district is much higher. These numbers can serve as a touchstone for estimating the cost of a national i2 initiative at various scales.

Success of the model will require ongoing funding, some of which may be reallocated from existing sources (e.g., induction and professional development budgets, Title I set aside funds). Significant new funding will also be required, however. Because schools with the highest concentrations of students from low-income families would be prioritized, an enhanced Title I program could serve as a natural mechanism for allocating and distributing this funding. Title I of the Every Student Succeeds Act (ESSA) is the primary source of federal support aimed at reducing the disparities in educational opportunity for students from low-income families, but critics charge that these funds are often used ineffectively. Tying new Title I funds to i2 Clusters would ensure that these federal dollars are effectively invested. Not only would these Clusters be specifically designed to generate and use scientifically-based evidence regarding student learning, but they would assign highly effective teachers to Title I-eligible schools. In addition, the well-established relationships between researchers and practitioners facilitated by the i2 Centers would make i2 Partnerships an efficient and effective context for expanding federally-funded research on high-priority problems of practice.

While the proposed i2 infrastructure is new, its individual elements may be quite familiar. These include the effort to provide greater support to new teachers through teacher residency programs, to allow for innovation in practice in Charter Schools, and to bridge the divide between universities and school districts through research-practice partnerships. But this proposal is much more than the sum of these parts in that: a) it integrates induction of new teachers, evidence-based innovation in practice, and attention to equity into a coherent whole; b) it creates stable contexts in which master teachers and faculty from both research universities and teacher training institutions routinely influence each other’s work; c) it calls for an infrastructure for improvement nationally while prioritizing local decision-making, and d) it is designed to allow sustainable funding through existing mechanisms.

The teaching hospitals in medicine that serve a similar function to the i2 Clusters receive upwards of $16 billion annually in federal and state dollars. Medicare and Medicaid are the stable funding mechanisms that support teaching hospitals to train new doctors and to care for low-income patients. And additional research funding to academic medical centers allows many of the teaching hospitals (in collaboration with university partners) to serve as locations for transformative research to improve medical practice. But while there are clear parallels between medicine and education in the need for supervised training in professional practice and for innovation to improve practice, the funding levels are strikingly different. Federal support through the Higher Education Act for partnerships between universities and school
districts to train new teachers is a mere $43 million annually. And annual funding for teacher quality initiatives more generally through ESSA Title II has never reached even $100 million a year. Total federal support for training new teachers therefore does not even approach 1% of the support for training new doctors—a mirror image of the disparity in funding between education research and medical research.

Medical doctors in the U.S. are arguably the best in the world because the nation has invested in health-care excellence. There are many outstanding teachers, researchers and designers in education, but we have not achieved a similar degree of excellence in our K-12 education system because we have not invested in organizing their expertise into an engine for innovation and professional excellence. Were that to change, the U.S. could raise the achievement of its students, attract and retain excellent teachers, disrupt persistent inequities, and once again make education the path to upward mobility for all U.S. students.
Introduction

The K-12 education system in the United States faces three major, persistent challenges: lagging student performance, a shortage of qualified teachers, and deep inequities in outcomes.

STUDENT PERFORMANCE

Lagging student performance is revealed in international rankings; in an increasingly global economy, U.S. 15-year-olds rank 13th among developed nations in reading, 18th in science, and 37th in mathematics.\(^1\) There are certainly gaps in the knowledge base on how to effectively educate all students to high standards that must be addressed, but in many cases, there is evidence regarding effective practice that has not penetrated the classroom. Some research knowledge has not been incorporated into resources that make the knowledge usable in practice. When resources are available, they may not reach teachers because the market for K-12 resources does not differentiate quality effectively. And when evidence-based resources do make their way inside school systems, they may not have the expected impact for reasons that are often not fully understood.\(^2\) Beyond what is known about instruction more generally, an uneven geography of opportunity leaves some communities with stressors that have a major impact on students’ preparedness for learning, challenging what can be accomplished in a classroom without attention to students’ physical, social and emotional needs.\(^3\)\(^4\) Here, too, much is known about addressing these needs.\(^5\)\(^6\)\(^7\)\(^8\) However, the education research sector is not currently organized and supported to focus attention on the knowledge and resources that are most critical for improving student outcomes,\(^9\) especially in areas of concentrated disadvantage.

TEACHER SHORTAGES

The shortage of qualified teachers is widespread. Almost every state has teacher shortages in some subjects or specializations (particularly math, science, special education, and English language development), and some states have teacher shortages in most areas—a phenomenon that is predicted to get worse in the coming years.\(^10\) The number of students enrolled in teacher preparation programs dropped by 36% between 2010 and 2018.\(^11\) Once in the workforce, teacher turnover contributes further to the shortage. After a single year of teaching, one in ten teachers leaves the profession entirely. Before they reach their 5th year of practice, almost half of all teachers have left their jobs: over 17% will have left the profession entirely, and another 30% will have moved to a different position.\(^12\) As a consequence of high turnover, schools accept teachers with inadequate training because they simply cannot fill the number of vacancies with well-trained candidates.\(^13\) In addition to costs for recruiting and hiring in response to teacher turnover, the return on districts’ investments in teacher quality are diminished by the number of teachers who are gone a year or two later. Estimates of the average cost to a school of losing a teacher is $20,000,\(^14\) with an annual cost to the nation...
estimated at $8 billion. Since teacher effectiveness is generally low in the first two years of teaching, attrition further exacerbates the performance problem, and imposes significant additional costs in student achievement.\textsuperscript{15, 16, 17}

**INEQUITABLE OUTCOMES**

Deep inequities in student outcomes are exacerbated by the performance and staffing problems. Schools with more than 55% students of color, for example, experience 70% higher teacher turnover; Title I schools that serve low-income students experience 50% higher turnover.\textsuperscript{19} The students in these schools are more likely to be taught by underprepared, inexperienced, and out-of-field teachers in general, but teacher shortages exacerbate the difference. A recent analysis of national data found that, while teacher shortages were driving up the number of uncertified teachers across the board, schools with high enrollment of students of color were *four times* more likely to employ uncertified teachers than schools serving few students of color.\textsuperscript{20} This fact alone may help to explain why the disparities in achievement between the highest and lowest socioeconomic status groups have been strikingly persistent for the past half-century,\textsuperscript{21, 22} despite efforts to narrow the gap. Importantly, a high turnover rate in a school has a negative effect on achievement not only for students who are taught by new teachers, but for all students in the school.\textsuperscript{23}

The stakes for students are high. Graduation rates are 11-percentage points lower for Black students and 9-percentage points lower for Latino students than for White students,\textsuperscript{24} with implications for future earnings and health that ripple across generations.\textsuperscript{25, 26} For Black men, the link between dropping out of high school and entering prison is so strong that it is sometimes referred to as the “school-to-prison pipeline”.\textsuperscript{27} The inequity has consequences not just for individuals and their families, but for our larger society as well. The lost tax revenue and costs for social services and incarceration are huge.\textsuperscript{28} The Alliance for Excellent Education estimates that a 5-percentage point increase in the national high school graduation rate for male students alone would save the nation $19.7 billion annually through additional earnings and crime-related savings.\textsuperscript{29}

The three major challenges are not new; nor are efforts by policy makers to improve education outcomes for all students.

**The Failure of Good Ideas**

Policy strategies that are logically sound have consistently failed to produce the desired outcomes. Most recently, states have adopted 21st Century Standards in an effort to raise the bar with respect to the content and practices that students are expected to master. The new standards are arguably a significant improvement over prior standards, but as with reform initiatives before them, the results have been disappointing. Referring to the most recent Programme for International Student Assessment (PISA), the New York Times reported, “The performance of American teenagers in reading and math has been stagnant since 2000.” The
article quoted Harvard Professor Daniel Koretz: “it’s really time to rethink the entire drift of policy reform because it just isn’t working.”

Alarm bells are being rung by policy makers as well. The National Council of State Legislatures (NCSL) made an unvarnished assessment in 2016: “most state education systems are falling dangerously behind the world, leaving the United States overwhelmingly underprepared to succeed in the 21st century economy.” The Council warns against “silver bullet” policies that have been commonplace in the U.S., noting that “after all of the national, state and district reform efforts during the decade following No Child Left Behind, the U.S. was outperformed not only by a majority of the advanced industrial nations, but by a growing number of less-developed nations as well.”

Recognizing both the need for an urgent response and the limitations of short-term solutions, NCSL recommended that action be taken immediately, but that the goal be the long-term development of a more systemic approach to building a high-performing system. Past policy efforts, such as the effort to create better standards, fall far short of a systemic response. In most states, there were no major investments in building the capacity of teachers to make the major shifts called for in the standards, even though few believed that capacity already existed. Nor were investments made in high-quality, vetted curriculum materials that could respond adequately to the changes demanded by the standards.

Policy makers are increasingly pointing to research that attributes the success of the world’s best performing education systems to policies that strengthen education as a system. In contrast, U.S. policies treat curriculum, assessment and accountability, teacher pre-service training, school districts’ induction of new teachers, and narrowing the equity gap as individual policy targets (see, for example, the Maryland Commission on Innovation and Excellence, Interim Report, 2019). While a consensus appears to be forming around the idea that we must think and act more systemically, how the U.S. can accomplish that goal is an open question. Marc Tucker, who has spent decades studying top performing education systems around the globe, refers to the U.S. challenge as the “highly fractured system of education governance in this country. Many actors who do not report to one another and who often have very different and even conflicting ideas about what ought to be done make decisions that result in often conflicting and frequently perverse incentives facing teachers, students, school administrators and others in our education system. That is not what we see when we look at the top-performing countries.”

How can the locally governed U.S. K-12 education system be transformed into a system that achieves the quality standards of countries such as Finland and Singapore, or provinces such as Shanghai and Ontario? These high-performing systems are different from the U.S. in many ways; in fact, they are different from each other as well. There is no blueprint for how to create a higher performing education system in a country in which education is as decentralized as in the U.S. But high-performing systems do point to essential ingredients: a systemic approach to...
building the professional skills of teachers, strengthening the alignment between teacher preparation and the tasks we ask teachers to perform, and a deliberate strategy for addressing the needs of students in the lowest socio-economic groups. Also required is a research infrastructure that can provide both short-term feedback on effectiveness and longer-term guidance regarding innovations, generating cycles of continuous improvement.

Rethinking the Solution

A Proposal for Innovation and Induction (I2) Clusters

To create the conditions for systemic improvement, we propose a major investment in Innovation and Induction (I2) Clusters: a set of schools within a district that stretches from pre-K through graduation. Much like teaching hospitals in medicine, these schools would be sites for the intensive induction of new teachers into the most up-to-date professional practice; they would be places where excellent practice and mentoring both catalyze and respond to research. The current practice, wherein researchers seek opportunities to conduct studies in school settings that further their own agendas, would be reversed; instead, researchers would be asked to apply their expertise to the schools’ most urgent problems of practice.

The i2 Clusters would have several defining features:

**STAFFING**

- **Master teachers** would be recruited to classrooms in these schools for two purposes:
  1. to be the primary teachers in classrooms in which they intensively mentor new teachers, and
  2. to engage with researchers on problem-solving innovations in practice.

  This arrangement addresses two problems simultaneously. First, experienced teachers who are ready for new challenges or who are looking for higher pay often leave teaching. Working in an i2 Cluster school would give master teachers higher pay and an opportunity to advance professionally while deepening their teaching expertise. Second, master teachers would have an incentive to teach students in the lowest performing schools.

- **New teachers** would go through an intensive, two-year induction experience in Cluster schools, spending a first year as a resident in a master teacher’s classroom and a second year teaching an independent class with regular coaching. Teachers currently engage in student teaching while they are in university programs. But there is a dramatic difference between joining a class well into the school year, and starting a class at the beginning of
the year when expectations must be established and classroom management routines created. Furthermore, the student teacher’s practice site may very well be different from the school where they first teach their own class. When new teachers are expected to sink or swim, one in ten leaves the profession entirely after the first year. There is evidence that providing new teachers with mentoring cuts the attrition rate by more than half. According to the Learning Policy Institute, “Changing attrition would reduce the projected shortages [of teachers] more than any other single factor.”

- **Third-year teachers** who have trained for two years in a Cluster school would move to an open position at another school in the district. These new teachers who have been immersed in a culture of reflective practice, data analysis, and collaborative problem-solving will take with them the research-based practices and improvement mindset that they experienced during their first two years, creating an engine for continuous improvement district-wide. In this way, every school in a district will benefit over time from the work in the i2 Cluster schools.

**GEOGRAPHY**

- **i2 Cluster schools** would be located in the most underserved area in the district in order to ensure that these students benefit directly from the investment. Having two adults in the classroom would significantly increase the learning opportunities for students, particularly given that one of those adults will be a master teacher. And having the attention of researchers and master teachers focused on the learning of these students will produce problem solutions that are effective in maximizing learning for this currently underserved population. No family would be required to have their student in a Cluster school, however; they could choose a school elsewhere in the district.

- **A feeder pattern** across the i2 Cluster schools would allow for the collection of longitudinal data that would reveal the impact of students’ experiences in early grades on their outcomes in later grades. When we invest early in students’ development of math sense, in their language development, or in their social and emotional skills, the returns often come in later years. Short-term studies cannot reveal which interventions work for which students in the long term. Detailed longitudinal data sets from i2 Cluster schools would make such analyses possible.

**PARTNERSHIPS**

- **University teaching faculty** would work in partnership with master teachers on research-based practices and skilled mentoring. In many districts, experienced teachers are assigned the responsibility of mentoring simply because they are willing. There is often no evaluation process for determining that those teachers are up to date on effective instructional practices, or that their mentoring skills are as developed as their teaching skills. Importantly, there is expertise that may be required to effectively work with students
who experience high levels of stress outside of school that mentor teachers may never have needed to develop. University faculty with specific expertise in research-based pedagogy, effective mentoring, and supportive interactions with students who experience adverse childhood events would be engaged in training mentors. They, or their research colleagues, would gather evidence regarding mentoring practices, so that the dollars spent on mentoring would be used with increasing effectiveness over time—not only in the i2 Cluster, but nationwide.

- **University researchers** would work in partnership with Cluster schools to collaboratively develop and study research-based programs and practices that improve student outcomes. Working inside low-performing schools would surface the range of issues that are barriers to achieving 21st century standards, focusing academic expertise on improving education for these underserved populations. The investment would produce both a knowledge base for improving practice and the tools, programs and protocols needed to support teachers to engage in more effective practice.

### Potential for Systemic Impact

The i2 Cluster strategy focuses on the classroom and school; yet we know that other aspects of the education system require attention. School and district leadership are crucial, as is the quality of teacher pre-service education, the alignment between what is taught and what is tested, student experiences outside the classroom, and numerous other factors. How, then, would i2 Clusters contribute to a more systemic improvement strategy?

The answer is that i2 Clusters would create a vantage point from which to view and act on other aspects of the system. They will not solve all problems, but they will shed light on those problems from the perspective that matters most: the experience of students and teachers in the classroom. For example, training the eyes of master teachers and researchers on the induction of new teachers who have come from various preparation programs will reveal weaknesses and variation across those programs that can spur change—weaknesses that can be hard to see when new teachers are scattered throughout the district and mentors act individually rather than as part of a designated, collaborative community. Observing variation across classrooms and schools in the i2 Cluster will shed light on strengths and weaknesses of school leaders that will inform the district efforts to support and improve their practice. With regard to curriculum and assessments, revealing the dilemmas of teachers who must choose between deeper instruction and the shallower coverage of content that generally appears on assessments may provide the clarity and evidence needed to realign assessments to instructional goals. And while the i2 Clusters would not change the stressors students experience outside of school, they will be positioned to identify and evaluate strategies for supporting the academic and emotional success of those students.
In summary, the i2 Clusters will not, by themselves, create systemic change. But they will be a perch from which the necessary changes become more visible, and a source of evidence on how those changes impact outcomes for students.

### Engaging in i2 Partnerships

#### Institutional Roles and Functions

An i2 Cluster would be the focal point of an i2 Partnership that would involve at least one school district, at least one research university, at least one major teacher preparation program (which may be in the research university, but often is not), an i2 Center, and a Governance Structure. The role of each is described in turn.

**SCHOOL DISTRICTS**

The i2 Partnerships would be anchored by the school districts as the core institutions. This is essential because a district has ultimate responsibility for the education of every student, including those in Cluster schools, and has the primary interest in and responsibility for the quality of its teachers. There would be key tasks that would fall to district leaders: outreach to the community regarding the location of an i2 Cluster; development of an i2 Cluster staffing plan, including evaluating and placing mentor teachers and reassignment of other staff; negotiation of a union agreement to allow for the new roles of mentor teacher and teacher resident; appointment of a cabinet member to lead the Cluster on the district’s behalf, and leadership in the planning and steering of implementation and problem-solving initiatives.

**RESEARCH UNIVERSITIES**

Researchers from one or more universities would be recruited to collaborate with practitioners in the i2 Cluster schools when their expertise is well matched to the focal problems of practice. Many research universities are already home to researchers who work with schools on grant-funded, researcher-initiated projects. These are the very researchers who are most likely to find working with an i2 Cluster enticing. Cluster schools would not present an opportunity for researchers to engage in basic scientific research in practice settings; research that belongs in laboratories would stay in laboratories. Rather, they would offer an opportunity to apply research knowledge to problems of practice and to gather and analyze evidence to understand the factors that increase student learning, teacher learning, and school-level outcomes.
TEACHER PREPARATION PROGRAMS

Faculty in teacher preparation institutions would be tapped for training mentor teachers. The major teacher preparation institutions are sometimes major research universities as well. Often, however, the two are separate. Faculty from teacher preparation institutions would have the opportunity to collaborate with teachers and with other researchers in the i2 Cluster schools, studying gaps in the knowledge of new teachers that should be addressed in pre-service training and incorporating new practices that have proven to be efficacious into their teacher education curriculum. We would expect the specific role to vary depending on the characteristics of the institutions in the specific area.

i2 CENTER

It is often assumed that universities and school districts simply need the will and the funding to collaborate and good things will happen. Experience demonstrates that neither the incentives nor the skill sets of those in the two institutions bode well for such an arrangement in the absence of a coordinating entity. Districts and universities have primary missions that are different from each other, creating a pull to serve the broader needs of the primary institution over the partnership (e.g., diverting funds for other purposes, prioritizing publication over problem-solving). If the partnership between a district and university fails, both institutions would continue as they were before the partnership was established.

To improve the incentive structure, we propose that a local i2 Center be established and charged with managing the partnership. The i2 Center would be independent of both the school district and the universities, but the independence would be constrained by a strict requirement that the district have ultimate veto authority over anything and everything that happens inside the schools, and by a governance structure that represents the interests of all partners. Because failure of the partnership would lead to the demise of the i2 Center itself, it will have every incentive to nurture the partnership’s success.

i2 Centers may well be located within an
existing partnership organization that has the trust of both the district and the research community. Staff would be recruited for, or trained in, the skills required for working effectively across research and practice institutions. Center directors would recruit practice-informed designers to ensure that the needs of students and teachers are well-served by any new resources that are developed in the i2 Cluster. They would also be responsible for communication with other i2 Centers to ensure that knowledge and resources are effectively shared.

In some cases, it may be desirable for two or more geographically close districts that partner with the same universities to form a local hub. Each district would have its own Cluster of schools, but a single i2 Center would serve the districts, allowing for economies of scale.

GOVERNANCE STRUCTURE

With multiple institutions involved, and with the interests of the school communities and policy makers warranting representation, a responsive governance structure for each i2 Partnership is essential. While it may vary from site to site, a model governing board might consist of the superintendent, the district’s chief academic officer (or equivalent role), a Cluster school principal representative, a member of the local school board, a representative from the mayor’s office, a member of the teacher’s union, the deans of the university departments participating in the i2 Partnership, one or more participating researcher(s), and several elected parent representatives from participating Cluster schools. It would be the role of this governing board to ensure that the i2 Cluster is serving all members of the partnership and, most importantly, the interest of students and their families. The governing board would have the authority to remove the i2 Center director, creating a further incentive for all parties to be well served.

Importantly, the i2 Center and its governing board would not compete with the district and its governing structure. Local operation of the school district would not change; it would still be responsive to the students, families and communities it serves, and the wide range of interests that include and go beyond student achievement in all schools, including the Cluster schools (including safety, distribution of resources, extracurricular opportunities, community events, etc.). The effort to continuously improve the quality of teaching and learning through the ongoing work of the i2 Partnership would, however, create a new, unwavering focus, even through changes in district leadership.

A Local Strategy for National Improvement

One of the most important characteristics of the i2 Cluster strategy is the deeply local nature of the enterprise: school districts work with local universities, in a partnership managed by a local i2 Center and governed by local leaders. Not only is governance of education by state and local authorities a tradition in the U.S., but federal control of education was precluded by the U.S. constitution. Any plan for systemic improvement must accommodate these realities. Moreover, geographic, historic, cultural, and economic conditions specific to states combine.
with state responsibility for provision of a public education system to generate diverse district contexts. Clearinghouses of research-based education interventions may be useful for guiding local practice, but there remains a monumental task in school districts to learn which changes in practice are feasible and can drive meaningful improvements in student learning in the local context. That monumental learning task requires a new infrastructure for evaluation and knowledge management.

At the same time, it is important that the knowledge and tools that fuel success in one site, as well as the lessons learned from research and development, be made available to those in other sites. There are enormous inefficiencies in each site working separately on the same problem. To avoid those inefficiencies, and to allow for continuous improvement in education outcomes nationally, will require a structure for information sharing and cross-site learning. We therefore propose a network structure linked through a national hub. It may be desirable to have state or regional hubs as well (much like the IES-funded Regional Education Laboratories) to provide more proximal support.

The i2 Network graphic provides a rough sketch of how a hub might look. Each i2 Partnership may include one or more districts and one or more universities served by their local i2 Center. The national coordinating hub would support capacity-building for new Centers, deploying lessons learned to date. It would be responsible for establishing networks that connect similar efforts across i2 Partnerships: networks on mathematics learning, reading comprehension, project-based learning, civics education, classroom management to name a few. The goal would be to create productive links across i2 Centers that would speed the spread of knowledge and innovations.

Funding the Initiative

What We Can Learn From Medicine

The new resources required for an i2 initiative will depend both on the number of dollars currently designated for related activities that can be reallocated and on the size of the enterprise. It is in the nation’s interest to strengthen the teaching profession by providing every new teacher with a highly supportive induction experience. This is precisely what has been done in medicine for the past century. But not every one of the more than 13,000 school districts would require the full i2 infrastructure (designated cluster schools, partnership with universities, and coordinating center). It is primarily, though not exclusively, the mid-size to large districts that are located near major universities where it would make most sense to build the i2 infrastructure.

This is precisely what we see in medicine. While there are over 1,000 teaching hospitals across the country, the largest third educate 75% of medical residents. And only 12% of all teaching
hospitals are part of the 120 academic medical centers (AMCs) which, like the proposed i2 Partnerships, include universities and integrate multiple functions. Penn Medicine, associated with the University of Pennsylvania, describes their role as follows:

“At an academic medical center, education, research, and clinical care are combined to provide the best possible clinical care, that uses cutting-edge technologies, resources and therapies... Doctors taking care of you aren’t just using the latest medical technologies; they’re also developing them.”

Even within the 120 AMCs, there is wide variation in the size of the research (innovation) and training activities. The teaching hospitals that are ranked high as major research centers are spread across the country in locations that are home to major universities, including (but not limited to) Baltimore, Boston, Birmingham, Chapel Hill, Chicago, Cleveland, Durham, Houston, Los Angeles, New Haven, New York, Philadelphia, Richmond, St. Louis, St. Paul, San Diego, San Francisco, Tampa, and Winston-Salem. The large majority of teaching hospitals have much less significant investments in research, even when they train large numbers of new doctors and serve large numbers of low-income patients. A fully mature i2 infrastructure may well be similar in both size and geographic location of innovation initiatives.

Because there is likely to be so much variation across sites, the costs of induction and innovation will be considered separately. Realizing the vision would require that they go hand in hand, however.

Costs for Induction

The average first year teacher in the U.S. earned $39,249 in 2017-18. If benefits are estimated at 50% of salary, the average new teacher who is assigned to a mentor’s class would cost an average of roughly $59,000. If we assume a mentor teacher is paid an average of $5,000 a year beyond his or her usual salary, and every group of 10 mentors would require an investment of $30,000 in training, the average cost per new teacher resident rises to $67,000.

Students in colleges of education earn credits for unpaid time in classrooms as student teachers. There may be arrangements negotiated with partner schools of education through which student teaching time is replaced partially or wholly with the full year residency in an i2 Cluster. If student teaching hours at a maximum account for a semester, such an arrangement would leave new teachers in the same financial position if they earned credit for half a year and the district paid a salary for half the year. The average cost per new teacher under such an arrangement would fall to $37,600. No new costs are added for mentoring in the second year under the assumption that the mentor teacher could coach the second year teacher while the resident is in charge of the mentor’s class.
The establishment of i2 Clusters would happen incrementally, and the ultimate scale of the enterprise is unknown. To calculate a maximum cost, we can assume that every one of the approximately 300,000 new teachers who enters the workforce yearly would receive the estimated half-year salary and benefits, and that every mentor would receive training by university faculty and a salary increase of $5,000. The total cost per year would be in the range of $11 billion, or 1.6% of expenditures for public elementary and secondary education. Even at full scale, these are overestimates because increased support for new teachers and opportunities for advancement within the profession would significantly reduce teacher attrition and thus the number of new teachers who must be hired.

Estimates by economists suggest that an investment of this size would more than pay for itself in the long run. In the short run, significant funding will be required. Where would these funds come from? We propose that the induction element be funded through a combination of reallocation of resources already available for teacher training and induction at the state and local levels, and by expansion of federal funding through the Every Student Succeeds Act (ESSA, Titles I and II) targeted to i2 Clusters.

REALLOCATION OF RESOURCES FOR TEACHER TRAINING AND INDUCTION

The most obvious funds for reallocation are those now spent on teacher induction. Twenty-six states provide some support for new teachers, and sixteen of those states set aside funds for induction. Districts also invest in induction, often subsidized by state funds. While induction support varies widely, study results reported in 2011 found that 85% of new teachers received some induction support, and a small percentage even received support over two years. Where district funds are available, concentrating them in the i2 Cluster schools would cover a portion of the induction costs.

Beyond expenditures for teacher training, states have federal Title I funds that are targeted to schools that serve significant numbers of low-income students. Because there is wide variation in the concentration of low-income students in Title I schools, Congressional regulations require a 7% set-aside (approximately $1 billion) for the lowest-performing 5% of schools. If the i2 Cluster includes the lowest performing schools as proposed, these funds could be allocated by the state to support Cluster activities.

EXPANDING FEDERAL FUNDING FOR TEACHER INDUCTION

While some states may be able to cover a portion of the induction costs, many states simply do not have the resources to do so. A substantial portion of the funds would need to flow from the federal budget via the states. There are compelling reasons for a major federal investment. As indicated previously, investments in teacher preparation will more than pay for themselves over time. Research on the long-term earnings gains of students if they are taught by more effective teachers suggests that even substantial investments in teacher quality will yield high returns long into the future, expanding federal and state revenues from taxes. Detailed analysis
indicates that replacing a teacher whose value added is in the bottom 5% of the distribution with a teacher whose value added is in the middle of the distribution for a single year would increase the present value of lifetime income by approximately $250,000 per classroom.\textsuperscript{52} We know that many of the teachers who are in the classroom for the first time fall into that bottom portion of the performance distribution.\textsuperscript{53,54} These estimates suggest that the cost of high-quality mentoring would easily pay for itself in federal tax revenues. An analysis conducted by Eric Hanushek suggests that replacing the bottom 5-8 percent of teachers with average teachers could move the U.S. near the top of the math and science ranking internationally and would have a present value of $100 trillion.\textsuperscript{55}

The case for federal funding is further bolstered when teaching and medicine are compared: Congress spent an estimated \textdollar16 billion on graduate medical training in 2015,\textsuperscript{56} compared to the \textdollar40.6 million\textsuperscript{57} allocated for the training of teachers that year through Title II of the Higher Education Act.\textsuperscript{58} Title II of ESSA provides funding for supporting effective educator development more generally, but to date funds allocated for this purpose have been well below \textdollar100 million. We have arguably the best trained doctors in the world because we have invested in their training. We cannot say the same for our teachers. And yet the cost to the nation of poor education outcomes is enormous.

Funding for medical training flows through Medicare (70%) and Medicaid (30%) to teaching hospitals in two ways: first, teaching hospitals are given funds for direct support of residents’ salaries, and second, they are paid a premium for every Medicare- and Medicaid-covered patient served in that teaching hospital.\textsuperscript{59} Title I could provide a premium for every Title I-eligible student taught in an i2 Cluster school, and either Title I or Title II might be used to provide the resources for the induction of new teacher residents.

In the face of intractable achievement gaps, many have argued that Title I funding should be increased. There are concerns, however, that those funds are presently not targeted effectively to improving outcomes for the lowest-income students.\textsuperscript{60} Were the federal government to increase Title I funding, i2 Clusters would provide an opportunity for concentrating additional funding in high-needs schools where the conditions are in place for improving the quality of teachers who serve low-income students and for investing in evidence-based practices that change outcomes for these students.
Costs for Innovation

There are three types of activities that fall within the innovation function. The first is the collection and analysis of detailed data in the i2 Cluster schools. Data analysis can lead to innovation by uncovering relationships across students, classrooms, and time that are otherwise not observable. Factors that are associated with positive outcomes can then be spread. Second, there may be challenges for which there are solutions that have proven successful in some contexts, but have not been tested in others. Implementation can be supported, evidence gathered on effectiveness, and efforts launched for continuous improvement. Third, there may be problems for which there are no compelling solutions available. In such cases, teams of researchers, designers, teachers, and administrators would engage in problem-solving research and development that would lead to new programs, practices, or protocols which would then be studied during implementation.

It is challenging to put a dollar cost on innovation activities. Unlike estimating the cost of induction for which we have a solid estimate of the number of new teachers and the average cost of a new teacher, there are no clear anchors for innovation initiatives. A single partnership may involve one initiative or ten, and an initiative may involve a single researchers or multiple researchers and an entire team of post-docs and doctoral students. In order to create a rough estimate to serve as a touchstone, we considered the single-year cost of an i2 Partnership engaged in routine data collection and analysis, in one modestly-sized implementation initiative, and one modestly-sized problem-solving R&D initiative. Using costs in an urban area for reference, the annual estimate would fall between $800,000 and $1 million.

EXPANDED FEDERAL FUNDING FOR EDUCATION INNOVATION AND RESEARCH

While the funds that are currently allocated to education research and development might in principle be partially reallocated to i2 Clusters, additional funding will be essential. The U.S. investment in education research and development is paltry; in 2019, the R&D budget for the U.S. Department of Education was less than 1% of the R&D budget for the National Institutes of Health, though NIH is not the only source of funding for medical research. When National Science Foundation (NSF) funding for education is added to the Department of Education’s research funding, the sum remains less than 3% of the NIH budget. While the investment level begs attention, the U.S. Department of Education has been challenged by Congress to produce evidence that the research it funds actually has an impact on classroom practice. The challenge is hard to meet because the education research enterprise is not organized to provide coherent answers to the pressing questions of education practice. We do not have the sites in education where researchers can shape their work in response to what is needed in practice settings.

The i2 Partnerships would be designed to address precisely this problem; they will provide the organizational arrangements that facilitate R&D focused on practice. They would allow any reallocation of current education research funds to i2 Clusters to yield greater returns with
respects to improving student learning, and may give Congress the confidence that additional research dollars would produce better outcomes for students. Mechanisms could be put in place to distribute funds based on capacity and merit; for example, the U.S. Department of Education and its Institute of Education Sciences might be charged with distributing funds based on criteria that provide some formula funding for data collection and analysis, and other funding based on review for merit.

Bring the Vision to Life

Learning From Other Initiatives

The vision is ambitious, involving new inter- and intra-institutional arrangements, union negotiations, and substantial new funding. Caution might lead one to ask: If it’s such a good idea, why hasn’t it been tried before?

The individual components of the i2 Partnerships have been tried; the autonomy to innovate within a school district is precisely what charter schools are granted. Linking pre-service

Case Examples

A metropolitan school district that serves 30,000 students has begun planning for an i2 Cluster. The district chose three of its lowest performing schools; it intends to begin with one in the first year and add a school in each of the two subsequent years. Phasing in will minimize the number of teachers who will move from their current school in a single year (master teachers coming into the Cluster school and the teachers they are replacing moving to other schools in the district). By year 3, all 30-40 first year teachers will be residents in an i2 Cluster school.

Faculty from three local universities—one a major research university and the other two major teacher preparation institutions—are enthusiastic about participation. In all years there will be university involvement in data collection and analysis. In year 1, there will be one implementation and one problem-solving initiative. In year two, it is assumed that one additional implementation initiative will be added. In year three, an additional problem-solving initiative is planned (4 initiatives in all).

The estimated cost in year 3 is approximately $5.7 million, with $3.3 million associated with induction, $1.6 million covering the research and innovation costs, and $.77 million associated with leadership of the initiative and management by the i2 Center. Approximately $.7 million of the total is the district’s allocation of staff time to the initiative, to be funded from the district’s current budget.

A district twice the size and located in an urban center is interested in becoming an i2 Partnership site as well. Rough estimates put the annual cost above $20 million because the district has upwards of 200 new teachers a year.
training and induction in a program that is more supportive of teachers and better prepares them for the realities of the classroom is the goal of the urban teacher residency programs. And lab schools are designed precisely for the purpose of providing an accessible practice context in which research can be conducted. What is different is that the i2 Clusters would combine the three functions, creating a whole that is much more than the sum of the parts. Charters can innovate, but they do not expand the knowledge base or induct teachers to serve in schools throughout the district. Teacher residency programs address the induction element, but do not generate new knowledge for practice through research. Lab schools do expand the knowledge base, but they are not structured to serve as the engines of improvement by feeding newly trained teachers to schools throughout the district. The structure and purpose of the i2 Clusters would be an invitation for those committed to any of these purposes to join in common cause with others in order to have a more transformative effect.

The closest initiative to the i2 Clusters is the Professional Development Schools that emerged from the Holmes project begun in the 1980s. The intention of these schools was to serve as sites for the placement of new teachers during their student teaching and induction periods to ensure that new teachers had adequate clinical training. While the initiative was less explicit about research and development playing a significant role, the goal was certainly to support the professionalization of teaching. But the Professional Development Schools faded.

There are key differences in this proposal, however, that can protect the i2 Partnerships from a similar fate. First, the i2 Cluster model is aligned with existing revenue streams at the federal, state, and local levels. Professional Development Schools did not have a designated, sustained source of funding. Second, the Professional Development Schools were initiated by single universities. i2 Partnerships would not be under the control of a university: School district leaders would play a central role in their leadership, and an i2 Center would ensure that multiple universities with strengths in both research and teacher preparation would be involved with the Cluster schools. Third, education researchers who focus on effective clinical training have made significant progress in identifying core practices, providing a starting point today for improving the practice of new teachers that was not available when the Professional Development Schools were launched. And finally, timing is everything. The Professional Development Schools were launched at a time when policy makers still believed education’s challenges could be solved by standards, accountability, and competition. Recent evidence to the contrary, as well as steep declines in international standing, has led many policy makers to conclude that a more systemic strategy that includes building teacher capacity is essential.

Getting Started

A mature innovation and induction infrastructure can reasonably be expected to include a number of i2 Centers similar to the 120 academic medical centers, and many more i2 Cluster schools in which some new teachers are trained in the thousands of school districts across the
country. But the movement to scale would best begin with demonstrations in a set of districts that would allow for testing the model in different contexts.

Districts best positioned to develop the model would be those that serve large numbers of low-income students, and have effective senior leadership, positive relationships with their teachers’ union, and collaborative relationships with area universities. One such district has begun planning for the first demonstration site (see case example).

The process of establishing an i2 Partnership in demonstration sites would be carefully documented so that future sites would have a blueprint for how the i2 model was established elsewhere. A network could be established once the number of i2 Centers warrants formalizing connections. The experience from these demonstration sites would inform national policy decisions regarding the speed and extent of scaling. As the knowledge and tools to support more effective mentoring emerge, they would be spread to districts that are not natural sites for i2 Centers but that will nonetheless induct new teachers.

A Different Future

The i2 Initiative will improve the outcomes for U.S. students through three central mechanisms. First, research-based innovations that emerge from i2 Partnerships will have a far greater chance of widespread impact because they will be designed for the realities of the classroom, improved until they work well in the hands of teachers and students, and shared through an established network. Second, research studies have found that far fewer teachers leave the profession in the first few years when they have had two years of high-quality induction. Districts will benefit financially when they are able to retain trained teachers, and students will benefit from the higher-quality instruction received from teachers with experience. Since new and uncertified teachers are more frequently located in schools with concentrations of low-income and minority students, the reduced turnover would have a disproportionate, positive impact on the students who are now the most underserved. The long-term impact of higher quality teaching on increased future earnings of students and on decreased spending for social services will produce a positive and significant return on the investment.

Finally, the professional identities of new teachers—forged in schools where reflective practice, data analysis, and collaborative problem solving are commonplace—will be carried into new school settings at the end of the induction period. As their numbers increase, a professional culture of continuous improvement will permeate the system. Since this is a feature of the highest performing education systems globally, we would expect the international competitiveness of the U.S. to rise, restoring our country to its former role as a leader in public education.


Ibid., p. 6.


39 Ibid.


41 Sutcher et al., 2016.

42 This subset of teaching hospitals belongs to the Council of Teaching Hospitals and Health Systems, part of the Association of American Medical Colleges.

43 Ibid.


46 Averages hide major variation across districts and states. We use the average in order to estimate the size of the investment at national scale.


51 Chetty et al., 2016.

52 Ibid.

53 Kini et al., 2016.

54 Rice, 2010.
55 Hanushek, 2011.


57 The 2018 number is $43 million, but the 2015 number is used here for comparison to spending on graduate medical education, which is not available for 2018. Congressional Research Service (CRS), (2018). The Higher Education Act (HEA): A Primer. Retrieved from: https://fas.org/sgp/crs/misc/R43351.pdf

58 Ibid.


61 The San Diego, CA, area was used as a reference.


