

Transforming Schools Through Information Technology

The Problem

Schools are encouraged today to become "data-driven" and to adopt "evidence-based practices." In responding to this press to move into the information age, districts are now making substantial investments in technology. These new initiatives, however often deviate far from the original promises of systemic reform. Instead of introducing technology in ways that informs professional learning and problem solving, many of these new tools are encouraging a routinizing of teachers' work around discrete skill training for students and increased standardized testing for those skills. This approach is likely to further entrench the pervasive "work to rules orientation" among urban school faculties that has frustrated many past reform initiatives.

To respond effectively, we need good exemplars of how technology can support instruction where students are asked to use their minds well, where adult work is transformed toward a more reflective, evidence-based practice, and where schools and districts have capacity to learn from their ongoing endeavors. Advancing a coherent program of research and development toward this end is the mission of our IIS group.

Mission and Rationale

We seek to develop an enhanced Information Infrastructure System (IIS) capable of supporting the efforts of teachers and other school-based professionals to advance more ambitious learning for every child. This system will inform classroom instruction, enhance the communication necessary for more viable internal accountability at the school-community level, and instantiate the necessary concepts and data bases for the emergence of a genuine case-based, evidence-based system of instructional analysis and improvement.

Accompanying this engineering activity is an integrated program of research where we seek to:

- Identify key principles for design and use of effective IIS systems, so that we can inform future developments by others in this domain;
- Study the impact on the beliefs and practices of school professionals and on the larger structural and normative features of their schools as new information tools are introduced;
- Advance more fundamental learning about the processes of school change, the effective introduction and diffusion of technology in schools, and the mechanics of promoting a more reflective, evidence-based school cultures; and

- Explore conditions under which educational research and development might more effectively engage the commercial marketplace.

A coherent R and D effort in this domain is especially timely. A number of factors, many emanating from federal policy, are now coalescing in large urban public school districts. These initiatives seek to tighten control over instruction by encouraging more data-driven decision making and alignment of school practices to high stakes state accountability systems and assessments. Supporting this movement is a rapid deployment of new technologies including data warehouses, student information systems, teacher portals including mandated on-line daily lesson planners, formative assessment systems aligned to accountability tests and so on. Ironically, in the name of advancing “evidence-based practices”, districts are rapidly deploying technologies whose long term consequences are unknown. While we believe that the thoughtful introduction of technology into schools can improve both adult and student work, we also worry that this potential may be squandered unless an intensive R and D enterprise is developed around it.

More specifically, major commercial actors, including the large textbook and test publishers, are aggressively moving to exert dominance over this expanding marketplace. Once such systems are procured by districts and locked in place, it may prove very difficult to reverse course should they prove problematic. To date, few in the academy have contributed to design of these technology systems, although there is now some emerging interest in studying their implementation.

Most problematic, many of these new developments deviate far from the original promises of systemic reform which sought more ambitious academic work for every child. Instead, technology is now making it possible for standardized test oriented instructional activities, once largely confined to the spring of the academic year, to now literally become the curriculum. In addition, many of these commercial products also represent a fundamentally different view about how technology might best mediate the work of adults in advancing instruction. Rather than seeing the “end game” as informing and enabling complex, professional problem-solving, these tools seek to routinize teachers’ work and further entrench the “work to rules” orientation typically found in large urban public districts.

In our view, the current movement of information technology into schools is inevitable. Districts will continue to advance on the paths already marked out unless coherent alternative systems are developed, field tested and carried forward into viable commercial products. This is the mission of the IIS project.

Organizing Principles

Transforming schools toward more ambitious instruction entails extensive organizational changes within an institution that has proven highly resistant to change. If this were a simple problem, others would have figured this out a long time ago. Changing the core

technology of schooling is a complex undertaking which, in an almost tautological sense, demands a complex conceptualization to undergird effective action.

Our aim, however, is not to develop an all encompassing intervention that could easily prove too difficult to be engaged effectively in most ordinary schools. Rather, we seek to use our “complex conceptualization” to identify constructive, “simple” levers that hold promise for catalyzing deeper changes down the road. In short, we seek to think complexly, but act strategically and opportunistically.

Start With Work on the Job Floor in Classrooms and Schools Seeking to Advance Ambitious Academic Work for Every Child

Our program of R and D takes root in a deep understanding of the day-to-day problems of practice in ordinary urban schools trying to advance more ambitious teaching and learning for every child. We place this school improvement work at the center of our design work.

As in every other workplace, technology can offer a constructive assist in solving specific work problems in schools. Moreover, an ensemble of such initiatives, coherently assembled, may constitute an effective press on the larger organizational problem of “loose coupling”, where much of the day-to-day decision making in schools bears little relationship to a school’s core mission of advancing student learning.

In short, our embrace of technology is not for its own sake, nor is it guided by some overly optimistic belief that we have found the “silver bullet.” Rather, we start with a basic understanding of the core problems of practice involved in day-to-day work in schools and ask the “value-added question”: “Could, how, where might introducing some new tools and social practices actually advance this work?”

We complement these design efforts with an integrated research program in the service of practice improvement. We do not engage in research “for its own right.” Nor are we doing this just to develop and test some theory or new method, or to bring an empirical patina to some ideology, or any of the other factors that can often direct work in the academy. We do, however, believe that the conceptual and methodological tools of the disciplines can offer a constructive assist in sharpening our thinking about the practical problems of instructional improvement. We also think that through engaging in such practical work, we might on some occasions even advance these “academic tools” a bit.

A Coordinated Focus on Three “Big Problems”

We have organized our overall project around three main problems confronting urban school reform:

1. **Informing instructional improvement**--toward more ambitious goals with timely, detailed displays about student learning and aligned “just in time” professional development resources in response to identified learning problems;
2. **Enhancing programmatic coordination**—with a clinical case management and internal accountability system for school-based supplemental services; and
3. **Connecting parents, schools and communities**—to add value to students’ learning during the “other 85 percent of children’s lives” outside of school.

We recognize that this represents a broad scope of work, but believe that a systemic endeavor here is important for practical, political and conceptual reasons. On the practical side, these three domains are organizationally inter-related. An effective solution in one area will make demands for coordinated action in other two domains. Correspondingly, incoherent practices in one domain may easily undermine promising initiatives in another.

On the political side, the press of high stakes accountability initiatives is driving schools to purchase an ensemble of tools, which promise short term standardized test score improvements, but may also further institutionalize the low level academic work currently experienced by many disadvantaged students and the non-professional work environment encountered by their teachers. Districts need a coherent, alternative view (including actual operating prototypes) of how technology could support both more ambitious aims for students and enable a professional practice that advances these aims.

Moreover, we believe that it is important to work in a coordinated fashion on the major problems in urban school practice because everything else in the environment of these schools, from their political economy to the forces in the marketplace to their own internal norms, exerts entropic effects which work at cross purposes to systemic improvement. We view coordinated work on these three key fronts as critical for coherent school change. For better or worse, conceiving of an enterprise-level solution (even if we only work on parts of this at a time) seems essential.

In short, developing a good prototype of what urban schools supported by technology could look like is a key objective in our work. It is important that district leaders be able to see this working in “real schools” with at most only marginal incremental resources. We expect that the diverse array of tools that we are developing, and what we learn about the principles that undergird them, will create broad intellectual resources that can be exploited by the commercial sector. We are confident that firms will build toward integrated systems like these if they sense an alternative market demand. Our development work aims to stimulate such demand.

From a more academic perspective, by working with a broad ensemble of tools, each designed in response to some pervasive problem of practice in urban schools, we maximize our opportunity to learn about the issues involved in effective technology mediation of adult work in schools. Through engineering efforts of this sort, we seek to develop a grounded theory of practice improvement which holds useful insights for

practitioners about school improvement and has analytic traction for guiding subsequent tool design and use efforts.

Conceiving of School Change as a Consolidation of Effects Problem

Our project is rooted in an overarching theory about how technology might actually advance systemic reform. The IIS project seeks to mediate multiple segments of work activity in schools with new tools and social practices. While each of these interventions may be relatively simple, they all share a common language that brings focus to common aims—advancing more ambitious learning objectives for students and reframing school work places as contexts for learning by adults as well. We posit that a fundamental change in the culture of schools can result through a consolidation of effects resulting from a series of simpler, discrete changes, provided that the overall guidance for those changes is coherent and the implementation plan is strategic.

Developing New Institutional Arrangements for More Effective R & D

As part of the overall mission of the IIS project, we seek to explore new pathways for creating useful technologies at scale. We believe that the academicians and clinicians are very good at identifying problems of practice and documenting how problems of practice look in the context of day-to-day work. Commercial actors, on the other hand, have very good mechanisms for creating technical applications that are robust and useable. We conjecture that a failure to blend these forms of expertise effectively leads to research insights that fail to make it into products and, products that do not reflect the realities of practice.

As a result, the IIS project seeks to engage in more direct partnerships among schools, the academy and commercial firms in the service of advancing a more effective educational R and D enterprise. We aim to both test viability of new institutional arrangements in this domain, and if they prove successful, begin to document the essential features necessary to create more such partnerships in the future.

We believe this effort may fill an important void in the organization of educational research. For the most part, the academy has ignored the type of activity being pursued by the IIS project, eschewing this domain for more prestigious pursuits such as using emerging principles from cognitive science to design new technology-based learning environments. This has left important development work to commercial actors in their exchanges with large districts and states. The incentives here however are very conservative. Commercial actors, not surprisingly, will market tools that they believe districts want to buy and tend to be reticent to engage in R and D for products beyond this horizon. Similarly, while the public rhetoric of districts may espouse a “break the mold” orientation, their purchasing decisions are more likely to be driven by immediately political needs in a *No Child Left Behind* environment to raise standardized test scores quickly. As a result, the overall incentive system works against meaningful instructional

innovations, tends to support the reification of very basic needs, and reinforces automation of simplistic ideas.

Our R and D efforts consciously focus on the near horizon—things that can be developed and used now that would actually support and advance the best intentions of educators to teach all students well. The academic-business-clinical partnerships at the heart of the IIS work represent an effort to explore use of a new institutional form to create high quality, technical innovation that can be sustained in practice.

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