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# Practice-Engaged Research and Development in Education

Community for Advancing Discovery Research in Education

Written for CADRE by:

**Policy Studies Associates**
Brenda J. Turnbull

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This paper argues for education research and development (R&D) arrangements and policies that systematically encourage engagement with practice. In contrast to policies that favor the deliberate efficacy testing and scaling of discrete innovations, it advocates greater attention to R&D that is centered in practitioners' purposes and environments, that exploits a multi-stage process of development as a rich source of learning, that attends to organizational and community contexts, and that builds cumulative knowledge across projects and studies.

In making these arguments, I draw a number of analogies to work in other fields, notably business and health services research. These analogies do not have the purpose of urging educators to emulate more of the practices of business and medicine. Rather than saying schools would work better if they were run like businesses, the paper cites business scholarship on some organizational constraints and opportunities for new approaches to R&D, observing that the R&D enterprise in education might benefit from considering analogous ideas. And rather than urging that education R&D continue to place the highest value on a medical model of randomized controlled trials, it suggests that health services research offers thought-provoking models of practice-engaged improvement through R&D. Recent work of the Carnegie Foundation for the Advancement of Teaching and discussions organized by the Knowledge Alliance have begun to put these ideas into the conversation about education R&D, as have the new priorities of the Institute for Education Sciences. This paper explores the rationale and some possible directions for such work.

## Start with Practitioners' Problems and Solutions

Some education research starts with questions that are well structured and well scaffolded by existing research, and some starts with a program to be tested, but some R&D studies should start with a problem experienced by practitioners. There are ways of supporting and facilitating the translation of practice problems into a research agenda. For example, with National Science Foundation support, the National Council of Teachers of Mathematics generated a research agenda in mathematics education (Arbaugh, Herbel-Eisenmann, Ramirez, Knuth, Kranendonk, & Quander 2009). It was a multi-step process, involving the solicitation of questions from practitioners; a four-day conference of researchers and practitioners in which 350 questions were conceptually grouped, analyzed, and synthesized into 25 questions; and finally the development of a report presenting and discussing 10 of the 25 questions as potential starting points for future research.

Such exercises are more the exception than the rule, but they are gaining in prominence and support. A 2010 forum of the Knowledge Alliance and the Learning First Alliance addressed "Using Evidence for a Change: Challenges for Research, Innovation, and Improvement in Education" (summarized at http://www.learningfirst.org/research). There, a researcher and a foundation president, Robert Balfanz and Robert Granger, advocated a research infrastructure that would support attention to problems of practice, grounded in practitioners' settings, and that would embrace "practice to research" as a better slogan than "research to practice."

Taking ill-defined problems of practice as a starting point is not necessarily comfortable for researchers or easy for research institutions, for whom pursuing an established line of inquiry or refining and testing a particular program is rewarding and routinized. One can see analogies to corporations, which develop and refine their product lines, internal organization, and standard operating procedures and then may be loath to engage in truly open-minded consideration of a range of customer needs. Gulati (2010) has attempted to combat this attitude, based on his research into product success, urging corporations not to "become attached to what they produce and sell" but rather to follow an "outside-in" approach that "starts with the marketplace and delves deeply into the problems and questions customers are facing in their lives." He suggests that among the capabilities needed are those of "customer-facing generalists along with product specialists." In education R&D, too, the work of specialized researchers should be complemented with that of customer-facing generalists who are adept at spanning boundaries, listening to practitioners, and communicating their new understanding back into the R&D enterprise. But because specialists often hold higher status than generalists, practitioners' problems must have some way of carrying authority: those who shape R&D agendas and award funding can make a difference by their willingness to invest in the search for solutions.

Once problems have been attentively and carefully documented, the classic tools of research come into play. By documenting occurrences of a problem, analyzing them, bringing existing theory to bear, and systematically probing the surrounding circumstances, researchers bring disciplined inquiry to the search for root causes. In this way, research adds value to the investigation of practitioners' problems, helping to ensure that causes rather than symptoms are addressed.

Practice offers another important starting point for R&D in the solutions, not just the problems, it contains. The identification and study of "positive deviance" offers practice-based windows on useful innovations (Rodin 2010, Schooley & Morales 2007). The idea is to spot members of a population (individuals, organizations, or other units) that are experiencing good outcomes, investigate their practices, and inductively find ideas potentially worth wide emulation. Rodin gives the example of children in a Vietnamese village who enjoyed especially good health, which researchers traced to their families' cooking practice of leaving tiny crustaceans in the rice they consumed rather than washing away this source of protein.

Researchers have much to offer in the study of positive deviance as well. Through descriptive theory building, they identify variables that are robustly related to desired outcomes (Carlile & Christensen 2005). In education, the analysis of positive deviance can benefit from the affordances of large administrative datasets in school districts, which capture a range of potential indicators of positive deviance in practice, along with indicators of problems. The Consortium on Chicago School Research has done exemplary work in mining administrative data, as well as gathering data through its own surveys, to find the leading indicators of desired outcomes such as high school graduation, college entry, and persistence in college.

## Conduct Research in Vivo

Understandably, some education-related research relies on the certainties of laboratory science, recognizing that in a setting where a range of variables are controlled, internally valid conclusions can be drawn with efficiency and reasonable certainty. Some researchers, however, argue for engagement in practice throughout the research enterprise, despite the messiness of all the variables at play.

A prominent example of research that engages in the world of practice is design-based research. Pioneered by Ann Brown and her colleagues (Brown 1992, Brown & Campione 1996, Collins 1992), it has continued into this century (Design-Based Research Collective 2003). It attends to the contexts for enactment of interventions, and it acknowledges the possibility of productive adaptation as part of implementation, contrasting with the "lethal mutations" of seriously flawed implementation. Design-based researchers have argued that their aims go well beyond formative evaluation as a step in development, but instead also lie in the realm of theory generation (Barab & Squire 2004). They seek both research insight and model development:

> [D]esign-based research goes beyond perfecting a particular product. The intention of design-based research in education is to inquire more broadly into the nature of learning in a complex system and to refine generative or predictive theories of learning. Models of successful innovation can be generated through such work—models, rather than particular artifacts or programs, are the goal. (Design-Based Research Collective 2003, p.7)

There are other types of practice-engaged research as well. For example, LearnLab in the Pittsburgh Science of Learning Center focuses on "in vivo" studies, which have "ecological validity" because they are situated in real learning settings and have real-world time frames—a feature that they share in common with design-based research—but which have two additional key features. Pittsburgh's in vivo studies also use random assignment, and they address an instructional variable that is a "fine-grained instructional method or principle" (http://www.learnlab.org/about.php ). Thus they narrow the scope of the inquiry in some important ways without sacrificing the authenticity of working in practice settings.

For researchers working in deep engagement with practice, theory is not only an aim but an essential guide to managing the complexity of the data and analysis. These research approaches require simultaneously tight and loose coupling; some of the work must be structured around constructs that are known to matter, while the researchers remain alert to patterns in the data that signal potential new insights. Otherwise, they risk drowning in the oceans of unmanageable data that practice settings can present to the conscientious researcher (Dede 2003).

## Build Knowledge by Building Interventions

By placing the center of gravity for development in practice settings, developers bring together two sources of value in R&D: propositions systematically tested through the collection and analysis of evidence; and practitioners' insights into the problems they encounter and the

solutions that succeed in their contexts. Developers, who often work in research-intensive communities such as universities, can learn from immersion in real-world practice settings. This is a premise for the work of the Strategic Education Research Partnership (SERP), in which leading university-based researchers team up for multi-year engagements with major school systems in a mutual commitment to identify and address problems of practice. Starting with a "problem of importance to the district," the SERP team undertakes to produce tools, practice-relevant scholarship, and research instruments (SERP Institute 2010).

The time scale for practice-engaged development projects can vary greatly. SERP development typically unfolds over a period of years, but the health services field offers examples of much faster cycles. The Institute for Healthcare Improvement (IHI) has "90-Day R&D" projects that address specific questions of practice (Institute for Healthcare Improvement 2009). In the first 30 days, a scan of the literature and a set of interviews inform development of a technical brief which describes the project's aim, the landscape, theories that could inform solutions, and specifications for solutions. For the next 30 days, participating health-care organizations participate as sites for testing and developing ideas about solutions. Finally, 30 days are spent in summarizing the findings and identifying ways of disseminating them.

The field of design also offers models for fast-paced development immersed in practice. "Put customers in the midst of everything," urges Tim Brown (2008) in a much-read *Harvard Business Review* article on "design thinking." He offers the example of a collaboration between his firm, IDEO, and Kaiser Permanente in a project that re-engineered the process of nurses' shift changes in hospitals. The practitioners' problems were that they spent inordinate time exchanging information about patients, and yet often key information was missed. Within a week, the innovation team had created a prototype solution consisting of software and procedures. "The goal of prototyping isn't to finish," Brown writes; instead, "It is to learn about the strengths and weaknesses of the idea and to identify new directions that further prototypes might take" (p. 87).

Similarly, in an education R&D project that incorporates design thinking, the building of a prototype might be thought of as a simple, rough-draft stage on the way to later versions, which benefit from cycles of systematic field testing and improvement (Tripp & Bichelmeyer 1990). Design thinking emphasizes that the cycles should be rapid and should allow for iterative refinement of the problem statement as well as the solution.

Through the process of development, practitioners may arrive at a more precise understanding of their purposes and needs. The initial statement of a problem of practice often misses the mark; it may address symptoms rather than root causes, or fail to anticipate the unintended consequences of a hasty solution. Development can help. From studies of product innovation, Thomke and von Hippel concluded, "Frequently, customers don't fully understand their needs until they try out prototypes" (2002).

Thomke offers these rules for "enlightened experimentation" in innovation (2001):

- "Organize for rapid experimentation."

- "Fail early and often, but avoid mistakes." That is, develop multiple prototypes quickly and learn from the ways in which they do not work—but design the experiments well, controlling variables that can be controlled, and using repeated trials as a way of compensating for the variables that cannot be controlled.

Rapid prototyping, a development procedure often used in the software industry, has been held up as an example for education R&D (Bryk & Gomez 2008). Bjerede (2010), in a blog post on education technology, suggests that lengthy field trials of tightly engineered designs for education ("clunky to use and difficult to modify") run the risk of irrelevance in rapidly changing contexts, and she observes that software developers bypass this trap through rapid prototyping: "…we code up some simple end-to-end functionality, throw it out for people to use, and then improve it iteratively based on feedback from our users."

Evaluators' skills can bring disciplined thinking into the rapid cycles of design or development in practice. New work on "developmental evaluation" articulates designs by which evaluators participate alongside practitioners who are engaged in solving problems through developing and adapting innovations (Patton 2010). In developmental evaluation, as in rapid prototyping, the emphasis is on "early stage innovation in complex environments" (Gamble 2008). Patton specifically contrasts the aims and methods of developmental evaluation with those that are suitable for a different theory of change, one focused on replication of best practices. He emphasizes the identification of key principles in an innovation, flexibility in design for adaptation, and the assessment of the contextual conditions that will make adaptation necessary. The evaluator's skills in disciplined inquiry are essential: developmental evaluation does not mean that practitioners have the final say on every question but rather that local knowledge is made explicit for testing.

Policy actors and funders have a role to play in reframing accountability around adaptability and learning and permitting evaluation to work in the service of adaptation. Ebrahim (2005) has argued for changing the norms of accountability for nonprofit organizations, away from adherence to top-down prescriptions and toward longer-term accountability for pursuing a mission and engaging in organizational learning.

By contrast, recent policy in education and other fields has required that evaluation and R&D focus on the types of internal and external validity best captured through experimental designs of well specified interventions, which may then emerge as suitable for dissemination as best practices. These designs essentially require that the intervention be frozen into stasis for replication. With a sound theory and a lengthy development period, this approach can yield valid inferences about effectiveness, and these are not to be dismissed. However, developers express concerns about either lingering too long in the development phase—risking irrelevance if and when their intervention is finally declared effective—or rushing to randomized trials. At an event organized by the What Works Clearinghouse, a developer criticized the imperative of rushing into formal controlled trials when she would prefer to be exploring and learning from variation:

> …in most cases, we have to move forward with a very tightly rigorous, usually randomized controlled trial study of a program's effectiveness during the first year of

> publication. What I should be doing that first year of publication is more research around how does the program work, how does it best fit certain learners, how should it be implemented. But instead, I'm racing into a randomized controlled trial to prove effectiveness. (Baughman in What Works Clearinghouse 2008 pp. 42-43)

## Open the Development Process to Many Participants

Practice-engaged development in education would be open to a wide range of contributors. R&D professionals, perhaps based in different organizations with different missions, would build programs grounded in theory, while practitioners would use their craft knowledge and observations to help reshape the programs.

The Reading Recovery program, a decades-old intervention in elementary reading, demonstrates the benefits of decentralized participation in data collection, analysis, and program refinement (Bryk 2009). It has a robust practice-engaged network with active participation by teachers and researchers. Over the years, this community has amassed a huge base of evidence on teaching and learning, which has been routinely analyzed for program improvement. Data on the students' characteristics and contexts are incorporated into the analysis, permitting the researchers to understand variations in the observed results.

Increasingly, technology supports the work of cross-organizational communities of inquiry. For nonprofit organizations pursuing related missions and programs, FSG Impact Advisors has created platforms for sharing measurement systems (Kramer, Parkhurst, & Vaidyanathan, 2010). They observe that the sharing of systems and data in standard formats can save administrative effort for organizations and their funders alike. More ambitiously, this has the potential to support interorganizational networks in which shared data and cooperative analysis may enable learning about issues from a variety of perspectives.

In business, research on "open innovation" and "open R&D" sheds light on some of the conditions, processes, and challenges associated with collaboration of various kinds in R&D. Business scholars have described arrangements for knowledge management that bring insights into the R&D process from outside the firm, that carry ideas from firms to customers, and that support "co-creation" in R&D (Albertini & Muzzi 2010, Enkel et al. 2009). Co-creation has also been called "community engineering for innovation" (Enkel et al. 2009), a phrase that may resonate in current discussions of innovation in education, where both networked arrangements and the "engineering" of research ideas into usable resources are subjects of much interest. New work on future arrangements for commercial R&D also points to bodies of research addressing the structures, processes, and content of user-driven innovation (Gassman et al. 2010). In mining this literature for insights applicable to education, a good deal of translation has to be done, starting with substitution of the aim of improving teaching and learning for the aim of making a profit. However, in considering a wide range of ways to structure interactions between producers and "customers" of education R&D, the experiences of firms, as analyzed by researchers, can suggest possibilities worth further exploration.

The democratization of R&D through extensive practitioner participation may cause some to worry that sound scholarship will lose out. In other scholarly fields, however, participation in research and development is opening up to crowdsourcing, with results that have been deemed surprisingly good. This includes everything from organizing amateur astronomers to scan the sky to offering cash prizes for working inventions. In an example of allowing open participation in one of the more hallowed customs of academe, the humanities journal *Shakespeare Quarterly* recently substituted online comments, open to the public, for traditional blind peer review. Authors had the option of posting their manuscripts for comment; the editors invited selected experts to offer comments but did not restrict access to the site. The editors made the final choice of articles for publication, but without reliance on traditional peer review. Interviewed by a reporter after the process had concluded, the authors spoke highly of the volume and quality of comments they received, and observers commented that this process had advantages over traditional peer review, specifically in its power to generate discussion and bring articles to press more rapidly (Cohen 2010).

## Broaden the Focus for R&D

Context matters. Learners, teachers, and instructional materials operate in organizations, in communities, in policy systems (local, state, and federal), and in professional networks. All of these contexts offer targets for improvement through R&D, as well as footholds and impediments for program implementation. By studying contexts, researchers and developers can arrive at insights for the design of innovations that support practitioners' learning.

Some advocate the study of individual and organizational supports for the implementation of research-based programs. Penuel and colleagues, for example, make the case for systematically studying program implementation in schools, and they describe the methods and results of several efforts to do so in conjunction with supporting professional development for program implementation (Penuel, Frank, Fishman, Sabelli, & Cheng 2009). They argue that the scaffolding of professional development and other supports for implementation are themselves worthy objects of study deserving substantially more attention from researchers and funding agencies. They also argue that what is learned in such studies can inform the design as well as the scale-up and sustainability of innovative research-based programs, and that co-design with practitioners—with researchers ultimately accountable for the results—is a logical part of a full vision of implementation research.

Similarly, Thompson and Wiliam (2008) studied teachers' groups organized for peer learning of formative assessment, and thereby gained a clearer understanding not only of teachers' learning but also of the essential elements of the formative-assessment practices they were introducing. They found that systematic inquiry into implementation in the school context helped them identify which practices in formative assessment should be precisely specified and which could be left to local adaptation.

The frame can be widened still further. The studies just discussed took as their subject the implementation of particular innovations in school contexts, but schools and other organizations in which students learn can also be studied for their "absorptive capacity," a concept from the

business literature. Absorptive capacity has had many definitions since Cohen and Levinthal (1990) called it a firm's ability to value, assimilate, and apply new knowledge, but a more recent conceptualization refers to a firm's capability for organizational learning through knowledge creation and use (Zahra & George 2002). This type of capability seems entirely applicable to schools as well: today's demands require schools to acquire and assimilate knowledge and to use it to solve problems. Policymakers want schools to develop absorptive capacity, and research could help by identifying the manifestations of this capacity and formulating ways to measure it and ways to nurture it.

Just as schools' absorptive capacity can be a subject for education research, so too can the knowledge-using capabilities of the larger systems in which schools are nested. These include school districts (Honig & Coburn 2008) and other collective arrangements, including the networks of schools implementing comprehensive models such as America's Choice and Success for All, and the schools run by charter management organizations.

Health services research has sought to bolster the use of effective practices by focusing on the delivery systems and contexts for practice improvement. In health services and public health, perhaps surprisingly, the research-practice gulf is as vexing as in education. Despite adherence to gold-standard procedures in medical research and the dissemination of treatment regimes by the pharmaceutical industry, the health field faces challenges in knowledge use for systems improvement. Translational research, which is sometimes defined as taking laboratory advances and engineering them into treatments, has another definition as well in the medical field: addressing quality improvement through "reorganizing and coordinating systems of care," helping practitioners "change behaviors and make more informed choices," and offering "point-of-care decision support tools" (Woolf 2008). All of these advances have counterparts in education that schools and teachers would welcome: coordination across education settings could be strengthened; practitioners need support for learning new skills and knowing when to use them; and on-the-spot diagnostic and prescriptive tools are useful in busy classrooms.

Veterans' Administration hospitals, among others, have engaged in collaborative work on practice improvement that incorporates research alongside practice. As an editorial in the British Medical Journal describes it:

> For these organisations the research function is not a separate activity hived off to experts in universities and other stand alone units (although many of the researchers have university appointments). The research agenda is set by the organisations' needs; the research is done collaboratively between the managers, the clinicians, and the researchers; and the results find their way directly into practice through integrated management structures and processes such as practice guidelines, computer reminders, test ordering systems, disease management teams, and so on. (Lomas 2003 p. 1301)

In these multi-organization efforts, the participating practitioners and researchers collaborate in rapid improvement cycles, gathering and using data. The learning networks of the Institute for Healthcare Improvement, similarly, engage thousands of health practitioners in testing interventions in disparate settings: the networks' approach "acknowledges that knowledge, skill,

methods, and resources vary widely, and uses those variations as an opportunity to compare, contrast, and learn" (McCannon & Perla 2009).

Matthew Miles, a scholar of innovation and improvement in education organizations, wrote about the value of "temporary systems" as engines of learning and practice improvement (2003). By bringing professionals together in task forces, research projects, and other enterprises of limited duration, he wrote, temporary systems mobilize energy, grant permission for creative exploration, and can ultimately change permanent organizations through the commitments made by their members who spend time working in temporary systems. The Institute for Healthcare Improvement learning networks and the Veterans' Administration hospitals' improvement initiatives appear to offer similar potential, and could be models for emulation in education improvement. The current R&D work of the Carnegie Foundation, much of it carried out in networks, illustrates the potential of these approaches in education (Bryk, Gomez, & Grunow 2010).

## Look at Multiple Interventions and Do Multiple Studies

The temporary systems for problem solving and improvement just described do not necessarily aim to replicate a single, validated intervention. Many fixes may be at play simultaneously—with potentially confounding effects, to be sure, but also reflecting the busy real-world environment in which practice and its improvement generally take place. Indeed, any education intervention generally coexists as one initiative among many in a district, school, or classroom, where it is likely to be adapted in unforeseen ways.

Because multiple interventions and adaptations are the reality in professional practice, the R&D enterprise should cultivate methods that sort through the complexity. These would include not only the isolation of treatment variables in controlled trials, but also the collection and analysis of data from practice settings in ways that offer partnership and learning opportunities to practitioners. Medical studies that seek "practice-based evidence for clinical practice improvement," while not producing conclusions about causality, generate hypotheses through the analysis of data that practitioners record on patients, treatments, and outcomes; a high volume of observational data can be gathered in a uniform framework at low cost, and the analyses then suggest treatment advances for further testing (Horn & Gassaway 2007). In education R&D, engaging practitioners in the long-term refinement of their work, perhaps through combinations of interventions that are carefully selected to complement each other, would be a worthwhile effort for R&D professionals, and one that policy should not discourage.

## Conclusion

On the premise that more flexible, reciprocal arrangements between R&D and practice can have intellectual merit as well as practical value, this paper has begun to suggest a range of options for further exploration. Much work remains to be done in testing and further developing these options, including the work of translation from other sectors into education. But the possibilities are intriguing and potentially useful to our field.

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