Design-Based Implementation Research: An Emerging Model for Transforming the Relationship of Research and Practice

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This chapter presents an introduction to design-based implementation research (DBIR). We describe the need for DBIR as a research approach that challenges educational researchers and practitioners to transcend traditional research/practice barriers to facilitate the design of educational interventions that are effective, sustainable, and scalable. We examine antecedents to DBIR, including evaluation research, community-based participatory research, design-based research, and implementation research. The four core principles of DBIR are explained: (1) a focus on persistent problems of practice from multiple stakeholders' perspectives; (2) a commitment to iterative, collaborative design; (3) a concern with developing

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theory and knowledge related to both classroom learning and implementation through systematic inquiry; and (4) a concern with developing capacity for sustaining change in systems. We close with an overview of the chapters contained in this NSSE Yearbook on DBIR and explain how each chapter contributes to the overall development of the DBIR approach.

This *National Society for the Study of Education Yearbook* presents an overview of an emerging model at the intersection of policy, research, and practice called *design-based implementation research (DBIR).* DBIR applies design-based perspectives and methods to address and study problems of implementation. As the chapters in this volume illustrate, DBIR challenges education researchers to break down barriers between sub-disciplines of educational research that isolate those who design and study innovations within classrooms from those who study the diffusion of innovations. It also aims to reconfigure the roles of researchers and practitioners in bringing about systemic change in ways that make it more likely that practitioners can adapt innovations productively to meet the needs of diverse students and that durable research–practice partnerships can sustain innovations that make a difference.

THE BROADER CHALLENGE

We are motivated in this endeavor by a broader concern with excellence and equity: We want to improve all learners' access to powerful, effective learning opportunities. Furthermore, we believe that these improvements must be scalable and sustainable, which requires changing the underlying assumptions about how such change is created and studied. We share these goals with a wide range of policy makers, social entrepreneurs, researchers, and educators who seek to improve educational systems and, in some cases, remake them entirely. We share with these educational stakeholders a focus on innovation, that is, the need to develop new designs that afford expanded pathways for young people to learn, participate in civic life, and earn a productive, sustainable living.

Gathering and interpreting evidence of effectiveness are important practices to integrate into the process of innovation. As with any design, we want to know whether it can work when it is given the support and resources necessary to have a positive effect on learning. A number of methodologies for determining "what works" have become quite sophisticated in recent years, thanks to federal investments in building the capacity of the field to conduct randomized controlled trials and analyze their results. Less well developed, however, are methods for answering the question of "what works where, when, and for whom" (Means & Penuel, 2005)

to understand the conditions under which designs can improve learning. Current conceptualizations of effectiveness and scaling up (e.g., McDonald, Keesler, Kauffmann, & Schneider, 2006) give even less attention to research that compares the efficacy of different approaches to creating the conditions necessary for designs to be well implemented and work effectively. Thus, we need to pose new kinds of questions related to practice and establish new methods within educational research to address them—including some that borrow from fields outside education, such as public health and medicine (Berwick, 2008).

It takes more than just sound evidence to bring about and sustain excellence and equity in systems. Studies of evaluation utilization going back decades (Johnson et al., 2009), as well as more recent research on evidence use in education (e.g., Coburn, Honig, & Stein, 2009), make clear that just because research may be rigorous does not mean it will be judged as relevant by practitioners and policy makers. Practitioners and policymakers consider a wide range of concerns when making decisions, and they often consider researchers' questions irrelevant to their own problems of practice (Coburn & Talbert, 2006). Similarly, the challenge of scaling up an efficacious intervention presents significant implementation challenges. Many programs that work on a small scale when well-supported by researchers fail when they are tested in effectiveness studies, in part because educators face many challenges in implementing them well. The few innovations—for example, Cognitive Tutor (Aleven & Koedinger, 2002; see also Means & Harris, 2013, this Yearbook)—that have gone to scale show just how hard it is to replicate positive outcomes underscore the importance of effective implementation and the need for systemic perspectives on improvement.

The distinctiveness of DBIR as an approach lies in the way that the authors in this volume conceptualize a new relationship between research and practice that is mutually transformative. In their historical analysis of a century of educational reform (now more than 15 years old, but still accurate and relevant), David Tyack and Larry Cuban (1995) noted the profound influence of Taylor's industrial model of scientific management on instructional practice. This model created a sharp division of labor between those who design innovations and those charged with implementing them. DBIR seeks to establish partnerships and engage in specific research projects that are based on a radically different conceptualization of the relationships between research and practice, and innovation developer and implementer. The authors in this Yearbook do not view research and development as a linear process that leads from design by researchers to scale up by practitioners. Instead, the relation of research to practice is more two-way and recursive, as conceptualized by Coburn and Stein (2010).

ANTECEDENTS OF DBIR

We do not claim that DBIR is an entirely new form of research or a model that has no parallels in educational research and evaluation. In fact, most of the key elements of the approach can be found in existing lines of research and in calls by researchers for new infrastructures for relating research and practice. At the same time, our claim is that DBIR emerges from the insights of past research and from both successful and unsuccessful attempts to bring educational innovations to scale. We outline some of these research traditions next.

EVALUATION RESEARCH

Three different models of evaluation research align closely with the aims of DBIR. One is utilization-focused evaluation, which directs evaluation researchers to consider intended uses of research by intended users in the design and conduct of evaluation (Patton, 1997, 2000). Like DBIR, utilization-focused evaluation emphasizes uses of research findings for programs, and it highlights the ways that stakeholder involvement in the process of evaluation can support the design and development of both programs and organizations (Patton, 2000). A second strand of evaluation research includes participatory models of evaluation (e.g., Cousins & Earl, 1992; Fetterman, 2001), in which stakeholders are involved in all aspects of evaluation research, from formulating questions to interpreting results. This model presumes that the knowledge people use to guide decision making within organizations is socially constructed and that participation in all aspects of the process of evaluation helps practitioners develop shared understandings of program goals, effects, and conditions for success (Cousins & Earl, 1992). Finally, theory-driven evaluation (Donaldson, 2007) emphasizes the importance of using a combination of social science and stakeholder theories in designing evaluation studies and of using evaluation to support program planning. A premise behind this model is that to be effective, interventions need to be grounded in theory and evidence from relevant social science disciplines (e.g., learning sciences, psychology, public health). Supovitz (2013, this Yearbook) explores the relation between DBIR and different models of evaluation, pointing out both intersections and conflicts between DBIR and traditional evaluation of educational innovations.

COMMUNITY-BASED PARTICIPATORY RESEARCH

Another antecedent of DBIR is community-based participatory research, in which researchers partner with people outside the academy to conduct joint research to advance local social change goals (Stewart & Shamdasani,

2006; Strand, Marullo, Cutforth, Stoecker, & Donohue, 2003; Weinberg, 2003). In contrast to research conducted in partnership with a single institution, community-based participatory research is often conducted in partnership with participants in social movements or with institutional stakeholders who are marginalized or have limited voice in institutions (for examples in education, see Oakes & Rogers, 2006, and O'Connor, Hanny, & Lewis, 2011). Community-based research is a hybrid practice: It is neither traditional basic research nor traditional evaluation, but a blend of research and action. As such, it is related to, and often thought of as a form of, participatory action research (Whyte, 1991). In other fields, notably social services and public health, community-based participatory research models have played key roles in supporting the implementation of evidence-based practices (see Palinkas & Soydan, 2012, for a review). In those fields, this model of research has been used to support the co-design of interventions (Wallerstein & Duran, 2010), as well as the scaling of interventions that have some evidence of efficacy—two practices we imagine that DBIR in education might support.

DESIGN-BASED RESEARCH

Within the learning sciences, design-based research offers a model for the design and testing of innovations within the crucible of classrooms and other contexts for learning (Cobb, Confrey, diSessa, Lehrer, & Schauble, 2003; O'Neill, 2012). As a model that emphasizes iterative cycles of design and testing, design-based research is particularly well-suited to making evidence-based improvements to innovations, in which evidence from both implementation and outcomes informs changes that design teams make to innovations for learning (see, e.g., Fishman, Marx, Best, & Tal, 2003). The potential utility of design research to support implementation also derives from its commitment to developing both theory that guides design decisions and practical tools that can be used to support local innovation and solve practical problems (Cobb et al., 2003). As in community-based participatory research, the collaborative nature of much design research positions practitioners as codesigners of solutions to problems, which can facilitate the development of usable tools that educators are willing to adopt (Penuel, Roschelle, & Shechtman, 2007).

IMPLEMENTATION RESEARCH

Implementation research is the systematic study of the implementation of innovations (Fixsen, Naoom, Blase, & Friedman, 2005; Werner, 2004). It encompasses descriptive studies of fidelity (e.g., Davidson, Fields, & Yang, 2009) and variation in implementation, as well as analyses of the conditions under which programs can be implemented effectively (e.g., Penuel

& Means, 2004; Penuel & Yarnall, 2005). Implementation research is often conducted within larger outcome studies, with the aim of analyzing how and how much variations in implementation matter for innovation effectiveness (e.g., Furtak et al., 2008; Lee, Penfield, & Maerten-Rivera, 2009; O'Donnell & Lynch, 2008). Notably, the study of implementation among policy researchers in education and sociologists of education has given an important context for theory development in these fields, from new institutionalism (Meyer & Rowan, 2006) to the diffusion of innovations (e.g., Frank, Zhao, & Borman, 2004). Implementation research studies conducted as part of policy and evaluation studies have yielded important practical insights over the years, notably about the inevitability of local adaptation and the need to support local actors' sense-making in shaping implementation of innovations (e.g., Berman & McLaughlin, 1975; Datnow, Hubbard, & Mehan, 1998; Means, Padilla, DeBarger, & Bakia, 2009).

SOCIAL DESIGN EXPERIMENTS

The aim of a social design experiment is to develop new tools and practices that produce new learning arrangements, especially for students from nondominant communities (Gutiérrez & Vossoughi, 2010). As in other forms of design research, researchers work in close partnerships with practitioners to develop these arrangements. In addition, consistent with DBIR, a focus is on transforming learning arrangements across different settings and levels. A key aim is to develop so-called third spaces, in which hybrid cultural practices enable students to bridge everyday and academic literacies (Gutiérrez, Baquedano-Lopez, & Tejada, 2000). Doing so often requires engaging community members in partnerships to ensure that the voices, tools, and practices of nondominant communities become integral to new learning arrangements. These partnerships, moreover, may incorporate cultural practices and beliefs of members of the community as a means to ensure that the design process becomes a third space (Bang, Medin, Washinawatok, & Chapman, 2010). A number of scholars are developing approaches to designing learning environments that engage community members and that attempt to help students relate everyday cultural practices to disciplinary ways of thinking and reasoning (Bang & Medin, 2008; DeBarger, Choppin, Beauvineau, & Moorthy, 2013, this Yearbook; Kirshner & Polman, 2013, this Yearbook; Tzou & Bell, 2010).

NEW INFRASTRUCTURES FOR RESEARCH-PRACTICE COLLABORATION

The National Research Council report *Strategic Education Research Partnership* laid out a vision for a new infrastructure to support more durable partnerships between researchers and practitioners aimed at improving

teaching and learning in America's schools (Donovan, Wigdor, & Snow, 2003). It called for the funding of an intermediary organization (Strategic Education Research Partnership [SERP]) that could broker connections between researchers and practitioners to identify and solve persistent problems of practice in education. The vision was an ambitious one: SERP was imagined as:

> . . . a place where interested school districts and researchers can link up around the SERP agenda; a place where new members of the field of teaching and its related research disciplines can join a program of research and development productively channeled to improving teaching and learning (we will propose fellowship and internship programs); and a place where many kinds of funders of education research and development can become part of an ongoing collaborative effort to improve student outcomes. (Donovan et al., 2003, p. 11)

We share this vision and imagine DBIR as necessarily creating a kind of "third space" (Gutiérrez, Rymes, & Larson, 1995), that is, a hybrid culture and place that researchers and practitioners create together and that is organized to be self-sustaining over time. Such a space depends on adherence to some core principles for organizing research and development efforts that build from the SERP Institute's experiences in attempting to build an infrastructure for collaboration in multiple school districts. Though our vision expands beyond work with school districts to encompass work with other kinds of educational institutions, community-based collaboratives, and even activist groups, adherence to these principles defines the boundaries of DBIR as an approach to research.

PRINCIPLES OF DBIR

The principles that we outline next are heuristics for guiding the organization of DBIR (Penuel, Fishman, Cheng, & Sabelli, 2011). We gave the authors of the chapters in this Yearbook guidance to use, adapt, and extend them to illustrate what DBIR is now and might be in the future. To provide readers with a sense of where we began, however, it is useful to describe the principles we think make a particular research project, program of research and development, or infrastructure for collaboration an example of DBIR. The four key principles are:

- A focus on persistent problems of practice from multiple stakeholders' perspectives;
- A commitment to iterative, collaborative design;

- A concern with developing theory and knowledge related to both classroom learning and implementation through systematic inquiry;
- A concern with developing capacity for sustaining change in systems.

In DBIR, Teams Form Around a Focus on Persistent Problems of Practice From Multiple Stakeholders' Perspectives

Design-based implementation research shares a commitment with other forms of design research (e.g., formative experiments, design experimentation) to using research to solve practical problems. In DBIR, multiple stakeholders help identify practical problems that are candidates to become the focus of research and development. Depending on the endeavor, participants may include researchers, organizational leaders, practitioners, parents and community members, and young people. A diversity of ideas on what problems should be taken up is likely not only across these different groups but also within them.

To Improve Practice, Teams Commit to Iterative, Collaborative Design

Collaborative design research often focuses on the development and testing of usable tools for improving teaching and learning in specific subject matter domains and settings (Cobb et al., 2003). As with other forms of design-based research, the design effort begins with a vision for learning that sets the focus for design (Collins, Joseph, & Bielaczyc, 2004). Other decisions that are critical within design-based research are important within DBIR as well, such as deciding on the composition of the design team, the process of iteration, and what evidence and rationales will form the basis for making changes to designs (Penuel, Confrey, Maloney, & Rupp, 2011; Penuel, Tatar, & Roschelle, 2004).

The objects of focus in design are a key distinction between DBIR and most design-based research. A hallmark of design-based research in the learning sciences has been a focus on improving learning environments in classrooms. At the same time, some learning scientists do focus more explicit attention on designing learning opportunities for teachers (e.g., Fishman et al., 2003), with an eye toward building capacity for teachers to enact innovations. DBIR encompasses such efforts, as well as designs for bringing about system-level improvements (Bryk, Gomez, & Grunow, 2011; Resnick & Spillane, 2006). The objects of design in DBIR may also include supports for implementers of informal education programs or for interventions that cross different settings. The key for all of these is that DBIR focuses not only on the design of tools and practices for learners but also on the design of the necessary means of support for

implementing those tools. Further, iterative cycles of design include iteration on and coordination of these different objects of design; that is, as teams refine or change tools for learning, they also refine or change tools for implementation in ways that reflect what is being learned through research (Fishman et al., 2003; Penuel & Fishman, 2012).

As a Strategy for Promoting Quality in the Research and Development Process, Teams Develop Theory and Knowledge Related to Both Classroom Learning and Implementation Through Systematic Inquiry

Though DBIR draws from the models of evaluation research described earlier, it diverges from them somewhat with respect to this principle. Most evaluation studies are motivated by practical and policy questions aimed at generating knowledge of specific programs' worth or value. But DBIR aims to develop knowledge that might be useful across a range of settings, either to inform design or to develop deeper understandings of learning of different kinds (e.g., student, teacher, organizational). DBIR also aims to develop theory for guiding design teams (which include practitioners) and future learning research in the ways that design-based research typically does (Edelson, 2002) and in the ways that well-structured case study research does (see Flyvbjerg, 2006).

The kinds of theories that are relevant to DBIR relate specifically to the objects of design, and they encompass theories of learning within and across subject matter domains, informal or everyday learning, teacher learning, organizational change, and leadership. In contrast to design-based research that focuses only on theories related to student learning in domains, DBIR can also contribute to theories of organizations and institutions that guide much contemporary policy research in education, particularly by pointing out how the deployment of new tools (e.g., curricula, technologies) can bring to light new needs for coordination across different system levels and for capacity building (e.g., Stein & Coburn, 2008).

Design-Based Implementation Research is Concerned With Developing Capacity for Sustaining Change in Systems

One strategy for promoting sustainability of designs is to develop capacity through efforts to develop organizational routines and processes that help innovations travel through a system. The predominant approaches to building capacity in education have long been focused on improving human capital of implementers—whether through professional development or by selecting and rewarding teachers on the basis of their students' test scores—and on developing and supplying improved material capital (e.g., curriculum) to them. DBIR focuses not only on building the skills of individual implementers—although this may be a positive

outcome of DBIR—but also on developing the capacity of the entire system to implement, scale, and sustain innovations. Moreover, we include researchers as individual participants and research organizations and universities as institutions that are part of the ecology of supports that must be strengthened to improve excellence and equity.

DEVELOPING DBIR AS AN APPROACH

As an approach to research on innovation design, development, and implementation, DBIR shows tremendous promise. To date, that promise has been realized both through the application of antecedent research approaches described earlier and through a range of programs, projects, and partnerships described throughout this Yearbook. But key questions and issues must be addressed for DBIR to be better understood and employed as a viable research approach for ongoing and future research and development toward broad and lasting school improvement.

The introduction of any "new" research approach frequently leads to two different reactions from the research community: the inclination to reject the approach as "too risky," or as "nothing new." In our conversations about DBIR since we first described it in *Educational Researcher* (Penuel, Fishman, et al., 2011), we have encountered both reactions, and the chapters in this Yearbook offer responses intended to clarify and examine DBIR from a range of perspectives. In our view, what is new about DBIR lies not in any single principle but in their integration. And what makes the development of DBIR worthwhile as an endeavor is that it expands methods available for developing evidence related to the implementation, efficacy, and scaling of innovations.

This Yearbook emerges from an NSF-sponsored workshop held at the Presidio of San Francisco, California, in 2011. The workshop convened practitioners who have been engaged with researchers in creating sustainable innovations, education scholars with a diverse range of theoretical and methodological expertise, and representatives of public and private funding agencies with a history of supporting research to create and sustain educational innovation. Participants in that workshop both developed a preliminary shared understanding of DBIR and surfaced many issues and tensions that are both inherent in DBIR work and that exist between DBIR and other research approaches. The chapters in this Yearbook were selected to capture and represent both those understandings and challenges to help clarify what is unique about DBIR and to illustrate how DBIR provides a pathway toward more productive research on innovation.

The challenges that the chapters in this Yearbook take up are multiple, and they stem from the needs of different stakeholders in educational

improvement: (1) the need to identify theories and methods that are appropriate for research that focuses simultaneously on classroom teaching and learning and on the policies and systems that support those improvements at scale; (2) the need to develop cross-setting, cross-sector perspectives on improving teaching and learning; (3) the need to develop methods for working in partnership with practitioners to negotiate the focus of their work and to organize design to include a wide range of stakeholders in schools and communities; (4) the need to develop standards of evidence appropriate to the questions we pose in research; and (5) the need for policies and infrastructures that help sustain partnerships and grow our capacity for continuous improvement and sustainable change.

THEORIES AND METHODS OF DBIR

All rigorous scientific inquiry in education is guided by theory and employs methods suitable to address questions posed (National Research Council, 2002). But the kinds of questions we pose in DBIR are broader than the basic questions, "What is happening?" "Is there a systematic effect? and "How or why is it happening?" (cf. National Research Council). DBIR researchers ask such questions as, "What works when, for whom, and under what conditions?" and, "How can we make this innovation work under a wide range of conditions?" Whereas descriptive and experimental methods and theories of learning may be appropriate for the first set of questions, they may, by themselves, not be adequate for addressing the second set of questions posed by DBIR researchers. In their chapter, Jennifer Russell, Kara Jackson, Andy Krumm and Ken Frank (2013, this Yearbook) present four examples of DBIR projects and how each takes up theories of learning and implementation that guide design and development. In their analysis of these examples, they describe the research methods employed and how these methods address the questions taken up.

DEVELOPING A CROSS-SETTING PERSPECTIVE ON TEACHING AND LEARNING

A key construct emerging within both the learning sciences and policy research in education is the importance of considering learning as unfolding over time across multiple settings (Banks et al., 2007). Learning is not bounded by the classroom, and it does not take place only in formal settings. Improving student learning outcomes depends on taking into account learners' history of engagement with particular content areas, the forms their engagement with that content takes in different settings of their lives, and the organization of learners' access to opportunities to engage with specific domains. This broadened perspective on where and

how learning takes place is an important anchor for DBIR as a model for developing partnerships to improve the design and implementation of educational interventions.

The chapters in this section both outline this life-long, life-wide perspective on learning and present examples of research–practice partnerships in which cross-setting interventions are being developed and their implementation is being studied and promoted through partnership activity. In the first chapter in this section, Milbrey McLaughlin and Rebecca London (2013, this Yearbook) describe the work of the Youth Data Archive (YDA) at Stanford University's John W. Gardner Center. The YDA makes it possible for people from different sectors to organize knowledge from diverse sources in order to gain new insight into persistent problems and to identify new problems that can be addressed through coordinated cross-sector efforts. In their chapter, Ben Kirshner and Joe Polman (2013, this Yearbook) take up the question of what happens when innovations themselves move across different settings. In contrast to approaches that emphasize adherence or fidelity to program components, Kirshner and Polman discuss the need to authorize local adaptation and for designers to provide "signature tools" that enable productive—as opposed to maladaptive—adaptations of innovations.

DESIGNING ACROSS LEVELS

In educational systems, people who are charged with implementing programs often operate at and across different levels. In schools, these levels include the classroom, school, and district. In out-of-school systems, these levels might include a local site, a regional chapter, and a national headquarters organization. Most educational design, however, focuses on one of these levels. DBIR, by contrast, requires simultaneous attention to multiple levels of systems in design. If the goal is to develop and test a new mathematics curriculum, then designers must minimally attend to the conditions needed to support student learning in the classroom and to conditions for teacher learning (e.g., the mathematics they need to know, the principles underlying the curriculum), and to aligning materials for teachers and students with the policy context (e.g., standards, assessments; Roschelle, Knudsen, & Hegedus, 2010).

The chapters in this section describe efforts to design across multiple levels of a system. In their chapter, Bill Penuel, Cynthia Coburn, and Dan Gallagher (2013, this Yearbook) analyze how stakeholders negotiate the problems of practice that become the focus of joint work in projects that are structured as collaborative endeavors among researchers, district leaders, and teachers. In her chapter, Meredith Honig (2013, this Yearbook) focuses on the role that school district central staff play

in the implementation of interventions and considers what is required to organize supports for their learning through an approach she calls design-based leadership research. In their chapter, Hilda Borko and Janette Klingner (2013, this Yearbook) explore what it means to design scalable professional development that can be implemented effectively in a wide range of settings. Teachers are ultimately in control of classroom instruction, and therefore, any proposed change to instructional practice depends heavily on the ability to design and deliver professional development that is *scalable* and in which the *outcomes* of that professional development are predictable. In the last chapter in this section, Angela DeBarger, Jeffrey Choppin, Yves Beauvineau, and Savitha Moorthy (2013, this Yearbook) focus on professional development supports for teachers' adaptations of discourse-intensive pedagogies in both math and science. This chapter examines how teachers develop these adaptations in response to local classroom contexts that could not be fully anticipated by curriculum developers, as a means to develop criteria for what constitutes "productive adaptations" of materials.

FORMS OF EVIDENCE IN DBIR

Establishing standards of evidence is critical for any scholarly community, and DBIR is no exception. However, it is neither desirable nor possible to establish a "one-size-fits-all" approach to such standards. In this section of the Yearbook, authors present different approaches to generating evidence within DBIR that can be used to evaluate the success of change efforts and to inform design. Paul Cobb, Kara Jackson, Thomas Smith, Michael Sorum, and Erin Henrick (2013, this Yearbook) open this section by presenting the ongoing work of the Middle School Mathematics and the Institutional Setting of Teaching (MIST) project as an exemplar of DBIR. MIST engages researchers and district leaders in an iterative design process aimed at developing a coordinated system of learning supports for enacting high-quality mathematics instruction. A key to this work has been the development of methods designed to make visible and study the often-invisible work of instructional coordination. Barbara Means and Christopher Harris (2013, this Yearbook) address the topic of standards of evidence for DBIR by situating DBIR within broader conversations among policy makers and other researchers about the nature of evidence needed to inform decision making. The authors take up specifically how DBIR fits within current conceptions of what makes for quality research studies that can yield robust causal inferences about the impacts of programs. Jonathan Supovitz (2013, this Yearbook) interrogates the relationships between practitioners, program developers, and researchers to surface ways that notions of impartiality

and evidence change in a DBIR approach and what challenges this presents to established views of validity and evidence in program evaluation. This chapter considers the utility of identifying what evidence is needed for an intervention on the basis of its location of an intervention along a hypothetical "intervention development curve" as a framework for judging the adequacy of evidence in DBIR.

INFRASTRUCTURES IN SUPPORT OF DBIR

Just as the DBIR approach seeks to foster the creation of scalable and sustainable educational innovation through new combinations of research and practice partnerships, DBIR itself requires a different way to conceive of, fund, and support the ongoing conduct of research and development. This is an infrastructural challenge. The current policy and funding environment frames the research enterprise in particular ways, and DBIR challenges that framing. For instance, policy makers will need to broaden conceptions of evidence beyond focusing on "what works" to encourage researchers to develop evidence related to what works for whom, when, and under what conditions.

The final section of this Yearbook comprises chapters that present examples of new organizations and organizational structures for pursuing the work of DBIR and that critically examine existing infrastructures for supporting research in terms of what is needed for DBIR to be fully realized. The Strategic Education Research Partnership (SERP) was chartered by the National Academy of Sciences specifically to develop new working relationships between research and practice and to address pressing educational problems, and in many ways it exemplifies the DBIR principles. Suzanne Donovan, Catherine Snow, and Phil Daro (2013, this Yearbook) describe the history and work of SERP, with a focus on how that organization identifies important problems of practice and brokers relationships between practice and research to address those problems. Jimmy Scherrer, Nancy Israel, and Lauren Resnick (2013, this Yearbook) describe the Institute for Learning (IFL), an organization with a long history of focus on school reform. They examine work on both teacher effectiveness and student learning from the perspective of institutions, employing a metaphor of "nesting" to describe organizational structure. IFL has worked to design supports for "boundary crossers" who communicate new information across contexts, and the chapter explores how IFL has evolved over time and, with each iteration, has moved toward DBIR principles. Jon Dolle, Louis Gomez, Jennifer Russell, and Tony Bryk (2013, this Yearbook) describe a radically different approach to cross-boundary collaboration and improvement focused on networked improvement communities. They describe how the Carnegie

Foundation for the Advancement of Teaching forms partnerships with community colleges not only to focus on a specific problem of practice but also to construct social infrastructure for coordinating learning and improvement across different individuals, organizations, and contexts. Finally, Nora Sabelli and Chris Dede (2013, this Yearbook), who have both served as program officers at the National Science Foundation, bring their experience with infrastructure at the federal level to bear on an examination of the types of funding, policies and technical support required to enable DBIR to achieve its goals. Underlying these considerations is the issue of timescales and feedback loops in educational improvement and an examination of the ways that the structure of research in higher education must shift to better support extended partnership focused on implementation.

CONCLUSION

The chapters in this Yearbook unpack the principles that characterize DBIR. They provide details necessary for developing DBIR as a productive approach to designing effective, scalable, and sustainable educational interventions. Each chapter on its own tells only a part of the story, and the volume itself is a kind of prologue to developing DBIR.

DBIR is a means to an end, not a methodology to be promoted or followed for its own sake. The goal we all share is the transformation of educational systems so that all young people have access to powerful opportunities to learn. Designing and testing effective, scalable, and sustainable innovations using a DBIR approach is just one way to achieve that goal. There are other approaches for the design and evaluation of innovations; in the past, major changes to educational systems have accompanied major changes in society as a whole, such as happened during the industrial revolution (Tyack & Cuban, 1995) and in concert with major social movements (Oakes & Rogers, 2006). Such forces are likely to shape educational systems in the future, so we would be wise to remember that we cannot design practice; we can only design *for* practice (Spillane & Coldren, 2010). Similarly, DBIR exists alongside other approaches to research and development. Its success needs to be judged relative to these other approaches' success in producing innovations that can improve teaching and learning at scale.

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